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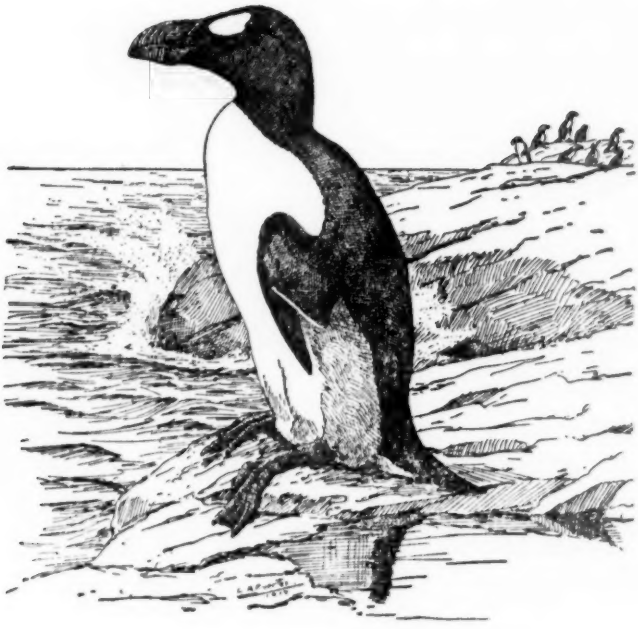

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MALE (*left*) AND FEMALE WHITE-WINGED BECARD (*Pachyramphus polychopterus*) ON A STRUTHANTHUS VINE, FROM A WASH DRAWING BY GEORGE MIKSCH SUTTON.

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LIFE HISTORY OF THE WHITE-WINGED BECARD

BY ALEXANDER F. SKUTCH

THE White-winged Becard (*Pachyramphus polychopterus*) is one of the smaller and more plainly attired members of the great cotinga family, a most heterogeneous group of passeriform birds related to the American flycatchers and confined to the warmer parts of the Western Hemisphere. Although the cotingas are so characteristic of the bird life of tropical America, very little is known of their nesting. In an earlier paper (Skutch, 1946), I gave an account of the life history of the Costa Rican Tityra (*Tityra semifasciata*), at the same time referring briefly to other studies of the nesting of members of this family. The present paper deals with a cotinga of quite different habits.

APPEARANCE AND HABITS

The White-winged Becard is a small bird hardly larger than a wood warbler, but with a thick-set body and relatively large head. As with many of the cotingas, male and female differ so greatly in appearance that it is not at once evident that they belong to the same species. The male has black upper plumage with gray rump and upper tail-coverts. The top of his head is glossy blue-black. His black wings bear two conspicuous white bands, and many of the remiges have white margins. Along each side of his back there is a prominent white stripe, formed by the outer webs of the scapular feathers. These white markings on the black upper plumage are visible from afar and aid in the recognition of the bird. His tail feathers are black with white tips. The sides of his head and under plumage are dark gray, becoming paler on the abdomen. His bill is blue-gray, tipped with black.

The female, about the same size as the male, is greenish-olive above, sometimes tinged with cinnamon on the back and rump. The feathers of her dusky wings are margined and tipped with yel-

lowish-buff and dull white. Her rectrices are dusky, tipped with buff. Her under plumage is light olive and pale yellow, her under wing-coverts, pale yellow. Although the colors of her plumage lack brilliance and are difficult to describe, the shades are so delicately blended that she is a very pretty bird.

The species ranges across the tropical American mainland from Guatemala to northern Argentina. There has been some difference of opinion as to how many forms inhabit Central America; but recent authors incline to the view that geographical variation within this area is so slight and inconstant that it is best to recognize only a single race, *P. polychopterus cinereiventris*, the subject of the present study. In Guatemala, where the White-winged Becard is rare, it appears to be confined to the humid lowlands and foothills on the Caribbean side. In Costa Rica it is found on both coasts, although perhaps in greater abundance on the Pacific side, where in the Térraba Valley it is fairly common. Both here and on the Caribbean slope I have found it nesting up to 3000 feet above sea-level but have not at any time met it at higher altitudes. Bangs (1902:40), however, reported it at 4000 feet in the Boquete district of western Panamá.

Like most cotingas, the White-winged Becard lives well up in the trees. I have found it chiefly among scattered trees growing in pastures or rising above low thickets, in the shade trees of coffee plantations, in light and open woodland, and at the edge of the primary forest. Contrary to the experience of Carriker (1910:668), I have never met these becards in small flocks, but always singly or in pairs, sometimes associating loosely with mixed companies of other small birds. I have not been able to assure myself that male and female stay together during the seasons when they do not nest; during these months I have seen the birds singly more often than in pairs. They subsist chiefly upon insects which they capture among the foliage, usually flying up to their prey and, while hovering, snatching it from the leaves—the usual way of cotingas. At a nest which I watched with care, I saw the parents bring only winged insects and larvae, never fruit. But Cherrie (1916:252) reported that in the Orinoco region the food of the White-winged Becard "consists apparently of about equal parts of insects and small fruits."

For several years a lone male becard roosted in a burío (*Heliocarpus*) tree close beside my house in the valley of El General, Costa Rica. His nightly perch was a slender twig at the very top of the tree, 35 or 40 feet above the ground, where he was screened above by the large, cordate leaves but was often readily visible from below.

VOICE

The White-winged Becard has a variety of utterances, among which are the softest and sweetest notes that I have heard from any bird, although others may surpass it in richness and fullness of tone. One of the most common calls of the male is a rapid sequence of about six soft, dulcet notes, each higher in pitch and weaker than its predecessor. On other occasions, he repeats six or seven times over, more deliberately, and with slight change in pitch, a full, melodious note like that which introduces the ascending series. The female voices similar but weaker notes and, while attending her nest, warbles a soft, liquid, long-drawn murmur.

During the nesting season, the male becard delivers at daybreak a beautiful song which is seldom heard after sunrise. In form this dawn-song resembles the more common song, but it differs subtly in tone-quality. It is composed of an emphasized first syllable followed by a descending series of sweet notes. I fear that I can come no nearer to describing in words this weirdly beautiful utterance. It is a true dawn-song, repeated tirelessly over and over for many minutes at daybreak, but seldom uttered later in the day except in moments of great excitement. Although a great many flycatchers sing dawn-songs, the White-winged Becard is the only member of the cotinga family from which I have heard such a performance.

I heard this dawn-song during many months of each year from 1946 to 1949, when a male becard roosted in the trees near my house. In 1946, I first recorded the dawn-song on April 26 and heard it almost daily until July 4, after which I was absent from the farm for several months. In 1947, he was first heard singing on March 21 and continued his matutinal caroling until September 2—a period of nearly six months. In 1948, he began on March 1 and the following morning sang for many minutes—until after sunrise. That year his period of dawn-singing lasted until the first week in September, slightly more than six months. Although silent on most subsequent mornings, he sang freely at daybreak on several days in late September, on October 8, and on November 1 and 10. In 1945, I had heard a becard sing at daybreak on several mornings in mid-October and on November 11 and 12. In 1949, the regular dawn-singing of the bird by my house again continued until the beginning of September.

In delivering his dawn-song, the becard won my admiration by his endurance no less than by the sweetness of his voice. On the morning of May 24, 1946, he began to sing by moonlight in the top of the burío tree where he slept. From 4:54 to 5:25 he performed on or

near his roost. Then he flew to the edge of the neighboring woods and continued until 5:46. Thus, he sang for 52 minutes. In the ten-minute interval from 5:15 to 5:25, he uttered his verse 83 times. If he sang uniformly at the same rate throughout the 52 minutes, he delivered 432 songs before seeking his breakfast.

On May 27, the becard first sang at 5:03, in the trees beside the house, where he continued until 5:20, when he flew to the edge of the woods. There he sang uninterruptedly until 5:39, when he paused for a minute or two, after which he resumed his dawn-song and carried on until 5:51. Ceasing then the dawn-song, he delivered the day song a few times. From 5:03 to 5:39 he gave 307 songs.

Although as a rule the becard ceases his dawn-singing at about sunrise and through the rest of the day delivers only notes of a somewhat different character, I have through the years accumulated a number of records of "dawn-singing" later in the day. On darkly cloudy or drizzly mornings, the male becard may continue, or resume, the dawn-song after the unseen sun is well above the horizon. On September 27, 1948, a becard sang his dawn-song in bright sunshine—a song most unusual for the hour as well as for the date; probably it was caused by some excitement which escaped me. In early July, 1946, the bird that slept near my house sang the dawn-song as he went to roost on a rainy evening.

In the middle of the afternoon of June 22, 1942, a becard delivered this song at intervals for well over an hour. When after a good deal of searching I caught a glimpse of the songster, I was surprised to find that it wore the pale colors of the female, although possibly it was a young male which had not yet begun to put on adult plumage. At about four o'clock in the afternoon of September 19 of the same year, I heard a becard's song, which continued almost without intermission for the next hour. Going out to investigate, I found a female, or young male, singing tirelessly in an African flame-of-the-forest tree (*Spathodea*) in front of the house. Another song came from the distance, and presently two or possibly three becards appeared in a neighboring *Inga* tree. They chased each other with spirit, singing the dawn-song intermittently; but I saw no actual fighting. In this instance, the delivery of the dawn-song late in the day was definitely associated with emotional stress, apparently resulting either from a territorial dispute or pair-formation. One dark and rainy afternoon in November, I heard a becard in female plumage repeat over and over a shortened version of the dawn-song.

NEST-BUILDING

In the valley of El General, January and February are usually the driest months; showers return in March; then the rainy season continues until the end of the year, abating somewhat in December. In this region, the White-winged Becard may begin to build as early as March 25; but usually it is April before the nest is started. Thus the becard, like the majority of the passerine birds of the valley, breeds in the wet season. The bulky, covered nest with the doorway in the side is placed in the top of a tree standing somewhat apart from others in a pasture or coffee plantation, or rising above lower thickets. Twenty-two nests of which I have records were from 14 to about 60 feet (4.3 to 18 meters) above the ground. Thirteen of these nests were at heights of 25 feet or more; the lowest, only 14 or 15 feet up, were in the rounded, spreading crowns of trees of *Cassia spectabilis* with very dense foliage, or in a heavy tangle of the parasitic vine *Struthanthus*. Because the nests are nearly always situated near the ends of long, slender branches far too weak to support a man's weight, I could reach only two of them. Three of the nests were close to large wasps' nests, possibly chosen for the protection from predatory animals which the insects afforded. Many tropical birds build close to hives of fiercely stinging wasps.

I watched the construction of one nest in the Motagua Valley in Guatemala and about 13 in Costa Rica. The female in each instance built with no help from the male, who, however, attended her as she worked. When beginning her nest, she usually brought long strands of inner bark or other fibrous material and gave each a complete turn around one of the arms of the supporting crotch, thereby assuring a firm attachment. After a good foundation had been accumulated, she built the walls upward and then inward, until the cavity of the nest was completely roofed over. Then she alternately took material inside for the lining and added material to the top to make the roof thicker. Usually females work at a leisurely pace, bringing only 8 to 12 billfuls in an hour; but one becard, building a late nest at the end of June, brought 17 loads of material during the course of an hour, and another came 10 times in half an hour in the early morning. While the female worked, her mate as a rule perched close to the nest, sang from time to time, and did not follow the female on her excursions to gather material, as does the male tityra. He drove away intruders with a loud clacking of his short, thick bill.

A nest found shortly after construction had begun on June 20, 1945, was still not completely roofed over on July 1, for the builder

entered and left from either side. But by July 6 it appeared to be completed, after a little more than two weeks of work.

My first accessible nest was a roughly spherical structure measuring 6 inches in height by 7 inches from front to back (15 by 18 cm.). The round entrance, in the side facing outward from the tree, was 1.5 inches (3.8 cm.) in diameter. This nest was composed chiefly of coarse bast fibers and lined with fibers and narrow strips of monocotyledonous leaves. I was unable to make a more detailed study of the composition of this nest, because it was still occupied by nestlings when I left the vicinity. Ten years later I took down a second accessible nest after the young had flown and I made a more careful analysis of its structure. A top-shaped mass, broadest above and tapering to a rounded bottom, it measured 7 inches in height by 7 to 7.5 inches in diameter (18 by 18 to 19 cm.). The chamber was 3 inches high, 2.5 inches from side to side, 3 inches from front to back (7.6 by 6.4 by 7.6 cm.). The doorway in the side, overhung by the projecting roof, was 1.5 inches high by 1.75 inches wide (3.8 by 4.5 cm.). This nest was composed chiefly of long, more or less shredded skeins of bast fibers, apparently mostly of the burío, a rapidly growing tree with very light wood, abundant on abandoned fields. Some of the pieces of bast fiber had a little outer bark attached to them. Only in the innermost layers of the nest-wall, surrounding the chamber, was other material of importance. Here there were many dead leaves, chiefly monocotyledonous, including bamboo leaves, strips of banana or plantain leaf that were often quite broad, fragments of palm fronds, and grass blades up to 13 inches in length. The very top of the nest was a loose, spreading mass of bast fibers, but beneath this, the body was strongly and compactly built of fibers and dry leaves. On top of all the becard had placed a number of large wing and tail feathers of domestic chickens. Other materials that I have found in fallen, partly destroyed nests or seen in the bills of building females were fibers from the leaf-sheaths of the banana; long, thread-like, dry, pistillate inflorescences of the small tree, *Myriocarpa;* and, in regions where it grows, much "Spanish moss" (*Tillandsia usneoides*).

Two nests of this same race (*P. p. cinereiventris*) are described by Allen (Todd and Carriker, 1922: 327) as very deep, open at the top, 9 to 10 inches in vertical length by 5 and 7 inches, respectively, in diameter. Since the describer did not see these nests in their natural position, I suspect that he mistook the horizontal for the vertical axis and that the doorway faced sideways as in Central American nests of the species. Still, the proportions of these nests from the Santa Marta region of Colombia are quite different from those of Costa

Rican nests. Nests of a related race (*P. p. tristis*) found in Trinidad are described by Belcher and Smooker (1936:811) as vertical and oval; one measured 600 by 280 millimeters.

THE EGGS

In my first accessible nest, the first egg was laid on May 24, 1939, the second on May 26, the third on May 27, and the fourth and last either after 9:30 a. m. on May 28 or on the following day. Hence, the interval between the deposition of successive eggs of the same set may be either one or two days. My second accessible nest contained two eggs when examined on June 11, 1949, and the last of the set of three was laid on the following day. Both of these nests were in the valley of El General, Costa Rica. Richmond (1893:508) found a nest on the Río Escondido in eastern Nicaragua, which on April 14 contained 3 eggs. Jewel (Stone, 1918:269) discovered in the Canal Zone, on June 18, a nest with 3 eggs, 2 of which hatched the same day. In Trinidad, sets of 3 were found by Belcher and Smooker (*loc. cit.*). Todd and Carriker (1922:328) reported a set of 3 from the Santa Marta region on Colombia. Thus in the countries bordering the Caribbean, the set of the White-winged Becard may consist of either 3 or 4 eggs, apparently more often the smaller number.

Only at my first low nest did I risk removing eggs for examination. Extracting them through the narrow doorway of the nest in the tree-top, while I hung precariously supported by one hand, was so delicate an operation that I took out only two for description and measurement. They were pale gray, mottled all over with brown, most heavily in a wreath about the larger end. They measured 20.2 by 15.1 and 19.8 by 14.3 millimeters.

INCUBATION

The eggs are incubated by the female alone. On June 4 and 5, 1937, I devoted a total of nine hours to watching an inaccessible nest in the top of a tall avocado tree. On the afternoon of the first day the female brought fibrous material and a tuft of spider coccoon to the outside of the nest, but the following morning she was taking inside small particles of food. It was evident that the eggs had hatched. During the 9 hours, I timed 20 sessions in the nest; these ranged from 3 to more than 38 minutes. The longest session had been started before I began to watch at 2:30 in the afternoon and was exceptional; the next longest session lasted only 18 minutes. Twenty absences varied from 2 to 36 minutes in length, but both extremes were recorded on June 5 after the eggs hatched. Before the female began to bring

food to the nestlings, the shortest recess that I timed was 11 minutes, the longest 29 minutes. Excluding parts of night sessions contained in my record, the female becard spent a total of 223 minutes in the nest and was away 291 minutes.

Approaching the nest in the tree-top, the female becard would alight upon a bough close by it and turn her big head from side to side, looking carefully about her. Often she flitted from branch to branch while continuing to scrutinize her surroundings. Then she advanced to a twig that passed close in front of her doorway, and from this hopped into the nest. When leaving, she darted through the narrow orifice head first and winged away without pausing in the avocado tree. As she flew overhead, it was easy to see that her tail feathers were all bent to the left from long sitting in the confined space of the nest. This was a permanent curvature, equally prominent when she returned at the end of her outing.

Like the Rose-throated Becard (*Platypsaris aglaiae*) and many other birds which build large or elaborate structures, this female White-winged Becard continued to add material to her nest to the very end of the period of incubation. But her mate, unlike the male Rose-throated Becard, did not share this occupation. This was in keeping with his failure to help his mate during the early period of concentrated building before the eggs were laid.

During the early morning, the male becard was most attentive to his partner. Frequently he perched near the nest while she was within and sang in his dulcet voice or merely preened. At other times he sang in the tops of neighboring trees. At times he seemed to call her forth, then followed as she winged away to search for food. Upon her return he escorted her to the nest. But later in the day he remained for long periods out of sight and hearing. During these long absences, sometimes lasting more than an hour, the female left and returned quite alone.

When her mate's song reached her within the nest, the female becard often replied with a similar song which, however, was much fainter, because her voice, ordinarily weaker than his, was muffled by the thick walls that surrounded her. At other times when she heard him while sitting in the nest, she warbled low, sweet notes. At times, she voiced these soft twitters while perching in front of the doorway, on the point of entering.

The most favorable for study of all my becards' nests was situated near the brow of the high hill behind my house in the valley of El General. Here in the open pasture stood a small tree of the anona family, its crown smothered beneath a great mass of the wiry green

stems of the parasitic *Struthanthus*. The becard had built amid the tangles of this vine, well out from the trunk of the tree, at a height of 14 feet above the steep slope. The nest seemed inaccessible; but the problem of reaching it was finally solved by planting a stout, twelve-foot post, which reached to within two feet of its bottom. When I wished to look into the nest, I set a ladder against the post, to be removed at the termination of the visit. I never drew out the eggs or nestlings but viewed them by inserting a small mirror into the chamber, while it was illuminated by a tiny bulb joined by a wire to an electric torch. While watching the becards, I sat beneath a guava tree on the crest of the ridge, where I had the nest somewhat below eye level, and the green valley of the Río Peña Blanca spread out before me, with the long, forested slopes and craggy summits of the Cordillera de Talamanca rising in the background.

As I passed beneath this nest on the evening of June 9, 1949, the female becard flew out; and the same thing happened the following evening. But the set of three eggs was not completed until June 12. Apparently she slept in the nest during the period of egg-laying. By June 13, if not earlier, diurnal incubation had begun. To study the birds' behavior during the incubation period, I watched from the crest of the hill from 5:30 to 11:24 on the morning of June 20. Since at this season rain falls almost every afternoon, I made my afternoon observations as the weather permitted: from 11:33 to 2:13 on June 21; from 12:53 to 3:44 on June 23; and from 4:12 to 5:40 on June 24. Each of these vigils was terminated by showers which I could see approaching across the valley.

During more than 10 hours of watching, I timed 17 sessions in the nest, ranging from 6 to 38 minutes and averaging 15.2 minutes, and 16 recesses ranging from 8 to 35 minutes and averaging 18.9 minutes. The female was in the nest only 45 per cent of the time. Like other becards she was a poor sitter, apparently depending upon the thick, enclosing walls to retain the heat of the eggs, which sometimes I found partially covered by loose material in her absence. Both her sessions and recesses were longest in the afternoon, and the longest period in the nest of all that I timed came late in the afternoon. Between 8:56 and 11:08 a. m. on June 20, she brought material for the nest on each of her seven returns to resume incubation. Usually she came with a blade of grass or the like, but once it was a feather. One load was deposited on top of the nest, but all the rest were taken inside as she entered to attend her eggs. These additions to the nest involved no special trips, but once she came to lay a chicken feather on the roof, then flew off to continue her recess. In the afternoons I did not see her add anything to her bulky structure.

Upon leaving her eggs, the becard darted swiftly out and away, rarely pausing among the vines that draped in front of her doorway. Only once did she vary this procedure, hopping first to the vines before taking wing. On her return, however, she always alighted in the maze of wiry stems some feet from the nest, paused to look around, then hopped through the tangle to a point nearer her doorway and stopped to look again, and so by degrees advanced until finally she darted up into the round entrance, audibly striking the leaves in front of it.

Although I did not see the male becard go near the nest, he was not inattentive to his mate, at least during the early morning. Often I heard his voice at the time of her return. Once when he sang at the edge of the neighboring high forest, the female, about to enter her nest, sang in response. Once while sitting in the nest, she twittered upon hearing her partner's song float in from the distance. As the morning grew older, he paid less attention to his mate and nest; and in the afternoons, I neither saw nor heard him. In this respect he resembled the male of the pair I had studied twelve years earlier, at a point about ten miles away.

In my first low nest, the last of the 4 eggs was laid between 9:30 a. m. on May 28 and 5 p. m. on May 29. Two nestlings hatched on June 15, and the following day there were 3. One of the eggs failed to hatch. The period of incubation was, then, 18 or 19 days. In the nest in the *Struthanthus*, the last of the 3 eggs was laid between noon on June 11 and 5 p. m. on June 12; and all hatched between the afternoon of June 29 and 3 p. m. on June 30. The period of incubation was about 18 days.

THE NESTLINGS

At the nest in the *Struthanthus*, all the shells had been removed before I saw the nestlings. The newly hatched becards have pink skin quite devoid of the natal down usual on passerine nestlings, and their eyes are tightly closed. When they are a week old, their pin feathers begin to push through the skin and their eyelids start to open. The feathers do not begin to unsheathe until the nestlings are 11 days old, but at 15 days they are fairly well clothed with plumage. They linger in the nest for another week.

On July 2, when the three nestlings in the vine tangle were two days old, I watched their nest for two hours, from 7:08 to 9:08 a. m. The female was brooding when I took my post on the hilltop overlooking the nest, but flew away seven minutes later. At 7:26 the male arrived in the vine tangle with food in his bill, but delayed there while his

mate twice passed him taking food to the nestlings, each time brooding for two or three minutes before going off to hunt again. After 12 minutes, the male had advanced to a point among the vines in front of the doorway, where he delayed half a minute more, then suddenly darted away without having delivered what he had brought. But at 7:41 he returned, clung in the doorway apparently feeding the nestlings, then left. On his third visit with food, the male delayed by the nest for four minutes before taking it to the doorway; and on the fourth visit he procrastinated 11 minutes, while his mate fed and brooded the nestlings. Then on his fifth visit he fed fairly promptly, but when he came the sixth time with food he waited in the vines for nine minutes before taking it to the nestlings. Thus the male becard had started to feed the young not over 2½ days, and possibly no more than 1½ days, after they hatched; but his great hesitancy in going to the doorway suggested that he was just beginning on the morning of July 2 and that this activity was still strange to him. So far as I had seen, he was not, like many male birds, in the habit of making visits of inspection to the well-closed nest during the period of incubation; whence I surmise that he learned of the arrival of the nestlings by seeing his mate carry food.

During the two hours, the male had gone to the doorway and apparently fed the nestlings 5 times; the female, 8 times. After each feeding, she brooded for periods ranging from 2 to 11 minutes—a total of 47 minutes in 2 hours.

On July 8, when the eight-day-old nestlings were in newly sprouting pin-feathers, I watched from 5:30 to 11:00 a. m. When I reached my observation post in the half light, the male was singing below me in the trees by the house. He continued his dawn-song until 5:52, then after an interval of silence sang a little more between 6:05 and 6:07. I did not see the female leave the nest, although without much doubt she had brooded the nearly naked nestlings through the night. She brought the first meal at 6:00, but did not stay to brood either then or at any time during the morning. The male first brought food at 6:20. Now the two parents were taking nearly equal shares in feeding the nestlings, together bringing food 34 times in the 5 hours from 6:00 to 11:00, or at the rate of 2.3 times per nestling per hour. So far as I could distinguish, the nestlings' diet consisted wholly of winged insects and larvae, usually green but sometimes brown in color, and nearly always of substantial size. Once the female brought a big, green, grasshopper-like insect, and I noticed several smaller creatures of the same type. The male now approached the nest with scarcely more hesitation than his mate; but each upon arriving alighted in the

tangle of vines some feet away from it and paused there to look around before advancing to the doorway. To deliver the food, they both clung in the orifice with back outward and somewhat downward, never entering. This position was apparently not easy for them to maintain; for if the food was not promptly taken by the nestlings, the adults dropped down to the vines below the doorway, after a

TABLE 1

RATES OF FEEDING THREE NESTLING WHITE-WINGED BECARDS

Hour a. m.	*Eight days old* *Number of feedings*			*Sixteen days old* *Number of feedings*		
	By Male	*By Female*	*Total*	*By Male*	*By Female*	*Total*
6:00– 7:00	2	2	4	2	3	5
7:00– 8:00	4	5	9	2	4	6
8:00– 9:00	4	2	6	2	1	3
9:00–10:00	1	6	7	1	5	6
10:00–11:00	5	3	8	6	6	12
Totals	16	18	34	13	19	32

pause returned to the entrance, then perhaps after a few seconds there dropped down a second time with food still held in the bill, if necessary repeating this three or four times until the insect vanished. Then they darted rapidly away, sometimes flying only a few feet above the grass as they winged over the crest of the hill, which was above the level of their nest. The female carried off droppings several times and once swallowed one. As I passed below the nest at the conclusion of my watch, I heard a little song coming from the featherless nestlings.

On July 16, when the three nestlings were 16 days old and well feathered, I again watched their nest through the morning. This time the male, after singing his long dawn-song, brought the first morsel at 6:23; the female first brought food a minute later. The number of feedings and the relative parts taken by the two parents were very much the same as eight days earlier, and the nestlings were fed at the rate of 2.1 times per hour for each one. (See table 1.) The greatly accelerated rate after ten o'clock was apparently caused by a change in the weather. The early morning was foggy and almost uncomfortably cool, and I noticed few insects flying. At about ten o'clock the sun began to beat hotly through the clouds; little black, biting flies and sweat bees became troublesomely abundant; and the parent becards brought food much more often. The nestlings soon became full. At 10:34, when their mother came with an insect of only moderate size, she took it to the doorway three times before it

was accepted by a nestling. At all other feedings a single visit to the doorway sufficed to deliver the food, the parent clinging upright at the entrance for a few seconds while passing the object to the nestlings. Again the food consisted largely of green insects, some of them of good size. Almost all the meals were substantial. I noticed no fruit. Twice I saw the female carry off a dropping, and once she swallowed one in the nest-tree. But I did not see the male take a share in cleaning the nest, which he never at any time entered while I was present. The insufficient attention to sanitation explained why the doorway and the ground below were well splashed with white droppings—a usual feature of becard nests at this stage. Once I saw the female drive a little gray Bellicose Elaenia (*Elaenia chiriquensis*) from the nest tree.

From time to time the sixteen-day-old nestlings gave a fair imitation of the day song of their parents, sometimes answering the male, who sang in the distance. When a parent coming with food shook the vine that supported the nest, they set up a chorus of high-pitched notes of a different character. Among non-oscinine birds, it is not unusual for the nestlings to give fair, if weak-voiced, imitations of the calls and songs of their elders. Among the true song-birds, with their often more complex songs and generally shorter nestling period, such singing in the nest is very rare.

All three becard nestlings left the nest in the vine tangle between 5 p. m. on July 20 and noon on July 21, at the age of approximately 21 days. All wore at this time a plumage much resembling that of their mother. As they roamed with their parents through the tree-tops, the fledglings repeated constantly, through much of the day, sweet notes and little songs, which often resembled the male's dawn-song and sometimes the day song. These melodious, but somewhat plaintive, sounds floated down from the trees for many minutes together. But the young becards kept themselves so well concealed amidst the foliage and moved so seldom, that I found it most difficult to catch sight of them. After a great deal of scanning of tree-tops, directed by the oft-repeated songs, I finally glimpsed one in the top of a guava tree in front of my house. I last saw the family together on August 5, when they passed through the trees by the house at the day's end. After their first flight, they never returned to sleep in their nest, but roosted amidst the foliage, exposed to the heavy rains of this season.

At several other nests, I saw the male becard help to feed the nestlings, which seems to be his regular practice, although he may be slow in beginning to attend them. Older nestlings may on occasion be

left unfed by both parents for surprisingly long periods. At the end of August, 1944, I devoted two hours of the morning to watching a high, inaccessible nest. The little birds within called much, with soft voices a good deal like those of the parents. From time to time, especially when the wind swayed the tree-top, or some bird alighted near the nest and shook it, they uttered a loud chorus of *cheeps* very different from their other calls. But neither parent came within sight during the two hours. The following day I spent 1¾ hours watching this nest, not all in one continuous period, and again failed to see a parent come with food. I thought that the nestlings would surely starve; but next morning their mother brought food to them twice in 45 minutes, and they called less.

These young becards left the nest about September 5. During their last days within they, too, uttered a subdued version of the male's dawn-song. For several days after their departure, I continued to hear this "song" from the trees at the edge of the woodland beside the pasture where the nest was situated. It was difficult to see the fledglings amidst the heavy foliage; but at last I glimpsed one of them, accompanied by both parents. It resembled its mother, except that its yellow bill was far brighter than hers.

Length of the Nesting Season

This nest, from which the nestlings flew about September 5, is one of the latest included in my records; but two others, built in the same tree in other years, held nestlings during August, one of them as late as August 14. In 1949, I found a nest occupied by well-grown nestlings on September 7. These nests were all in El General in the upper Térraba Valley of Costa Rica, at an elevation of about 2500 feet. The nest which I watched the becard build in the Motagua Valley of Guatemala on July 11, 1932, if successful, would also have sheltered nestlings until about the end of August. Hence the becards' breeding season covers about five months, from April to early September. I do not know how many broods may be reared. Losses of nests are high, and very late ones probably belong to birds which have lost earlier ones.

Enemies

The big nests of the White-winged Becard, conspicuously placed in the tree-tops, fall prey to numerous enemies, although doubtless they are above the reach, and escape the notice, of many of the more terrestrial nest-robbers. One of the chief enemies of the becard, at at least in southern Costa Rica, is the Parasitic Flycatcher (*Legatus*

leucophaius), which occupies the nests for its own brood, doubtless capturing them by the same strategy which I have seen it use to dispossess flycatchers of the genus *Myiozetetes* of their bulky, roofed nests; that is, by throwing out the eggs of the builder and rightful owner. I have twice found Parasitic Flycatchers rearing their families in nests built by White-winged Becards, and in other instances have seen the robbers hovering close by with their usual insolence while the becards were building. One nest, about which a pair of the flycatchers loitered as though only waiting for the becard to complete it before claiming it as their own, was occupied by a swarm of small, black melipone bees, which put an end to the dispute between the two kinds of birds. The insects proceeded to close up the nest's doorway with wax or some kindred substance, leaving only a small, spout-like opening for their passage in and out.

I have often found nests of the becard torn apart in the tree-tops where they had been built. This was apparently the work of toucans, probably the big *Ramphastos swainsonii*, an insatiable nest-robber. From its habit of hunting, especially during the nesting season, through the tops of the trees in the clearings not far from the forest, this bird would be more likely than any other predator to destroy the becards' nests. But, although I have watched them despoil nests of other birds, I have never actually seen them pillage one of the becards'.

Like the Rose-throated Becard, the White-winged Becard shows an amazingly strong attachment to its chosen nest-site. Toward the end of March, 1937, a becard began to build in the top of an avocado tree growing in a small coffee plantation. On April 5, I found the nest, still unfinished, lying on the ground. Two days later I noticed another nest, well begun, in the top of a neighboring avocado tree; but the following day this was also pulled out of the tree, by a toucan, I suspect. By May 10, this becard was completing a third nest in the top of still another avocado tree. The two most widely separated of her three nest-sites were only 40 feet apart. For a wide-ranging bird of the tree-tops, not confined by competition for territories to a narrow breeding area, this was unexpected loyalty to a chosen spot. In the third nest she at last hatched her eggs, only to lose her nestlings a few days later.

In four consecutive years there were White-winged Becard's nests in the top of the same tall targuá tree (*Croton draco*) in the pasture in front of my house. The targuá is common in the vicinity, yet this one had a peculiar attraction for the becard, even though most of the nests she started there were unsuccessful. In 1945, she was build-

ing at the beginning of May. During the following days this nest grew smaller instead of larger; and on May 10 the becard started a second nest in a neighboring fork of the same tree-top. By May 14 both nests had quite vanished. Yet a few days later a third structure was begun near the site of the first, but apparently never used for eggs. On July 12, I found the becard working at still another nest in this same tree-top. In this fourth nest she at last succeeded in rearing nestlings, which took wing in early September.

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SUMMARY

The White-winged Becard frequents scattered trees and open woodlands rather than heavy primary forest. It usually remains well above the ground. A lowland bird, it ranges upward to 3000, or in western Panamá 4000, feet above sea-level.

If catches insects by flying up to the foliage and snatching them off without alighting.

Both sexes utter soft notes of great beauty, but the male's voice is stronger. From March to early September, he delivers at daybreak a special dawn-song, repeating a melodious verse hundreds of times with scarcely a break for nearly an hour. Seldom heard after sunrise, this song may be given later in the day if the bird is greatly excited.

In Costa Rica, where most of these observations were made, nesting begins in late March or more commonly in April after the return of the rainy season. The very bulky nest with the doorway in the side is placed in tree-tops from 14 to 60 feet above the ground, nearly always in a position inaccessible to man.

The female builds alone while her mate perches near by, often singing.

The three or sometimes four eggs are incubated by the female alone. She is a restless sitter, apparently depending upon the nest's thick walls to keep the eggs warm. One female, watched for ten hours, was in the nest only 45 per cent of the time. Until the eggs hatch, the female brings much additional material to her bulky nest.

The incubation period at two nests was 18 or 19 days.

The newly hatched nestlings have closed eyes and pink skin quite devoid of down. Pin feathers sprout through the naked skin at the

age of a week; the feathers unsheathe at about 11 days; and the young are covered with plumage at 15 days. Before they can fly they utter good, but weak-voiced, imitations of their parents' songs. They leave the nest at the age of 21 days.

The female alone broods young nestlings; but when they were eight days old no diurnal brooding was observed. Both parents feed the nestlings, the male sometimes beginning a day or two after their hatching, sometimes taking longer to discover them, and eventually sharing the work about equally with his mate. The nestlings are fed winged insects and larvae, but apparently no fruit. When older they are fed at the rate of about 2.2 times per nestling per hour. Some of the droppings are carried off or eaten by the female; but the doorway of the nest, as well as the foliage beneath it, becomes soiled.

Fledglings do not return to sleep in the nest, which is apparently never used as a dormitory.

The nesting season in Costa Rica extends from late March or April to early September, but the number of broods is not known.

Becards' nests are captured and used for breeding by the Parasitic Flycatcher (*Legatus leucophaius*) and sometimes by melipone bees. Many nests are destroyed, apparently by toucans.

These becards show great attachment to the chosen nest-site, building three or four times in the same tree in one season if earlier nests are destroyed.

LITERATURE CITED

BANGS, O. 1902. On a second collection of birds made in Chiriquí by W. W. Brown, Jr. Proc. New England Zool. Club, 3: 15–70.

BELCHER, CHARLES, and G. D. SMOOKER. 1936. Birds of the Colony of Trinidad and Tobago, Pt. 4. Ibis, 1936: 792–813.

CARRIKER, M. A., JR. 1910. An annotated list of the birds of Costa Rica including Cocos Island. Ann. Carnegie Mus., 6: 314–915.

CHERRIE, GEORGE K. 1916. A contribution to the ornithology of the Orinoco region. Mus. Brooklyn Inst. Arts and Sci., Sci. Bull., 2 (6): 133a–374.

RICHMOND, CHARLES W. 1893. Notes on a collection of birds from eastern Nicaragua and the Río Frio, Costa Rica, with a description of a supposed new trogon. Proc. U. S. Natl. Mus., 16: 479–532.

SKUTCH, ALEXANDER F. 1946. Life history of the Costa Rican Tityra. Auk, 63: 327–362.

STONE, WITMER. 1918. Birds of the Panamá Canal Zone, with special reference to a collection made by Mr. Lindsey L. Jewel. Proc. Acad. Nat. Sci. Philadelphia, 70: 239–280.

TODD, W. E. CLYDE, and M. A. CARRIKER, JR. 1922. The birds of the Santa Marta region of Colombia: a study in altitudinal distribution. Ann. Carnegie Mus., 14: i–viii, 1–611.

Finca 'Los Cusingos,' San Isidro del General, Costa Rica, February 28, 1953.

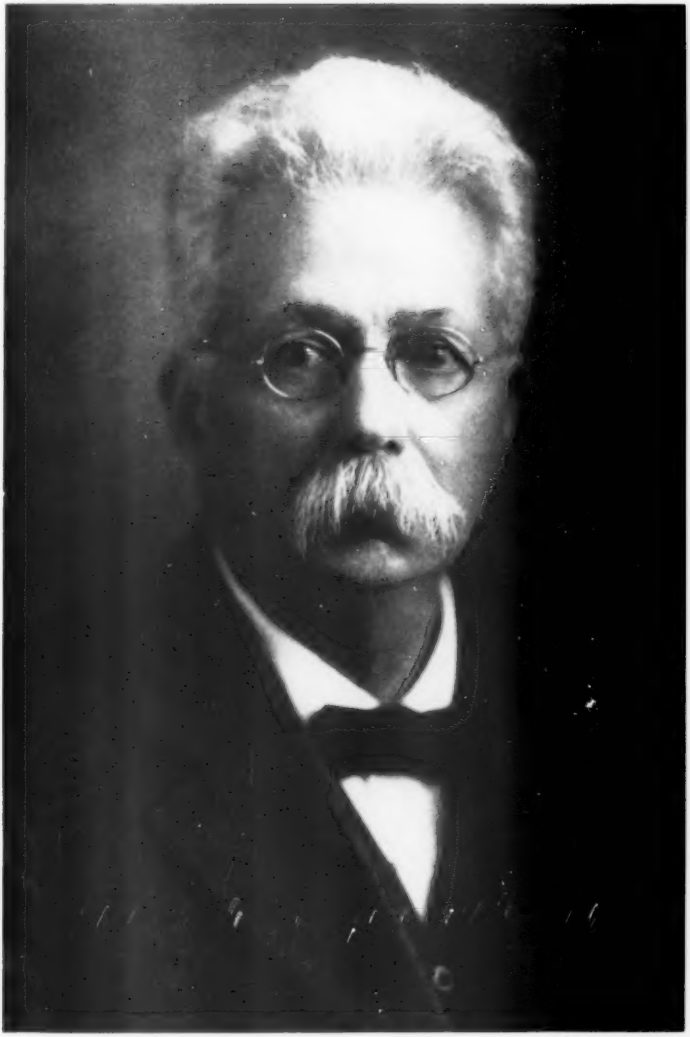
IN MEMORIAM: CLINTON HART MERRIAM

BY T. S. PALMER

CLINTON HART MERRIAM, son of Clinton Levi and Mary Hart Merriam, a Founder, Secretary, Treasurer, Councillor, past President, and Patron of the American Ornithologists' Union, died in Berkeley, California, March 19, 1942, at the age of 86. Twenty years of his life were spent in education and preparation for his life work, 4 in the practice of medicine, 25 in public service, and nearly 32 in retirement. Although well past fourscore years, he constantly lamented that life was too short. He was, in fact, a human dynamo of energy and progressed rapidly from one field to another in his knowledge and interests.

He was the eldest of a family of three children and was born in New York City, December 5, 1855, was educated by private tutors, and in 1872 was appointed naturalist of the Hayden Survey of Yellowstone Park. He was a student at the Sheffield Scientific School at Yale and graduated from the College of Physicians and Surgeons in New York in 1879. Among his classmates were A. K. Fisher, who soon gave up medicine for ornithology, and E. A. Mearns, the only one of the group who as an Army surgeon continued in the practice of his profession. While still a medical student he joined with others in founding the Linnaean Society of New York and was elected its first president. During the next few years he practiced medicine in Locust Grove, N. Y., and later made a trip to the Newfoundland sealing grounds as surgeon on the U. S. Fish Commission Steamer "Proteus."

In 1883 when the American Ornithologists' Union was organized, Dr. Merriam took an active part, was elected secretary and treasurer and appointed chairman of the committee on Geographic Distribution and Economic Ornithology. With characteristic energy he laid out the work of these committees on such a comprehensive scale that it was entirely beyond the resources of the Union. His father, with the assistance of the Senator from New York and Prof. S. F. Baird, Secretary of the Smithsonian Institution, secured an appropriation of $10,000 for this work in charge of an ornithologist as chief of a section of the Division of Entomology in the U. S. Department of Agriculture, under Prof. C. V. Riley. In the following year the section was made a separate Division of Economic Ornithology and Mammalogy, and in 1910 the status of a Bureau under the title of Bureau of Biological Survey. Thirty years later the Biological Survey was transferred to the Department of the Interior and com-



Harris and Ewing

CLINTON HART MERRIAM

bined with the U. S. Fish Commission as the Fish and Wildlife Service.

When the appropriation for an ornithologist was first passed by Congress, the Commissioner of Agriculture, Norman J. Coleman, invited the American Ornithologists' Union to nominate a candidate for the position. Dr. J. A. Allen, President of the Union, called a meeting of the Council in the office of Prof. S. F. Baird, Secretary of the Smithsonian Institution. Five members were present: J. A. Allen, S. F. Baird, Elliott Coues, H. W. Henshaw, and C. Hart Merriam. Dr. Allen called the council to order and stated the purpose of the meeting. Henshaw immediately nominated Merriam and the motion was seconded by Baird. On the vote Merriam was declared the nominee and Coues, who confidently expected to receive the nomination, did not receive a single vote.

In 1884, at the time of the meeting of the International Ornithological Congress, Dr. Merriam made his first and only trip to Europe, during which he met several eminent ornithologists, including Rudolph and William Blasius.

On October 15, 1886, Dr. Merriam married Virginia Elizabeth Gosnell, his secretary. They had two daughters, Dorothy, Mrs. Henry Abbot of Washington, D. C., and Zenaida, Mrs. M. W. Talbot of Berkeley, Calif. Their home at 1919 Sixteenth Street, N. W., was usually the meeting place of the Council when the A.O.U. convened in Washington. The house, a three-story brick structure, had the third floor given up to one large room adapted to the arrangement of his collection of mammals. Later on, when the mammal collection had been transferred to the U. S. National Museum, the space was cut up into several bedrooms. Still later, after his retirement the parlor on the first floor was transformed into an office.

Dr. Merriam took great delight in organizing field expeditions. During the decade following his first visit to California he organized six notable expeditions: San Francisco Mountain, August 1889; Southern Idaho, 1890; Death Valley, California, 1891; the transcontinental trip of the A.O.U. in 1902; Mount Shasta, California, 1898; and the Harriman Expedition to Alaska in 1899. He also directed the Nelson-Goldman Expedition to Mexico, which continued from 1890 to 1905. Of these the Harriman Expedition was the most important and had far reaching results.

In 1899 Mrs. E. H. Harriman, wife of the President of the Union Pacific Railroad, arranged with Dr. Merriam to outline a vacation trip for Mr. Harriman, whose physician had ordered him to take an extended rest from financial activities. A sea trip to Alaska for

several weeks was decided on, and the steamer "George W. Elder" of the Oregon Steam Navigation Company, a subsidiary of the Union Pacific Railroad, was detailed for the trip. Radio and television had not been invented and the vessel at sea was cut off from communication with New York and other financial centers. In order to keep Mr. Harriman occupied about a dozen eminent men, each a specialist in his subject, were invited to join the party which included Dr. W. H. Dall, an authority on Alaska; John Muir; Dr. W. E. Ritter of the University of California; Robert Ridgway, curator of birds in the U. S. National Museum; Dr. A. K. Fisher of the Biological Survey; Charles A. Keeler, the California poet; and others.

Mr. Harriman was much interested in hunting the big bears on the Kodiak Penninsula and in investigating the salmon fisheries and other resources of the Territory. As usual the plan of the expedition was greatly expanded, and at Mr. Harriman's request a detailed report of the various subjects was duly prepared. Dr. Merriam was asked to edit these reports; and to enable him to devote his entire time to this work and to the study of mammals, the so-called Harriman Fund was provided by Mrs. Harriman and a series of volumes on Alaska was prepared for publication. It may be noted in passing that as a result of this work the only report on mammals that Dr. Merriam published was a revision of the grizzly bears issued as North American Fauna, No. 41.

In 1890, when the Board on Geographic Names was established to determine the proper designation of places and fix the official spelling, Henry Gannett was made chairman and Dr. Merriam was appointed one of the members and after Mr. Gannett's retirement served as chairman for several years. During this time the controversy over the name of Mount Rainier versus Mount Tacoma was fully considered and finally decided in favor of Mount Rainier. Dr. Merriam was succeeded by Frank Bond, Chief Clerk of the General Land Office, who continued in that position until the Board was made a division of the Department of the Interior and reported to the Secretary of the Interior instead of to the President.

As a result of his trip to the Newfoundland sealing grounds, Dr. Merriam was always much interested in seals. In 1891 he was appointed, together with Dr. T. C. Mendenhall, Superintendent of the U. S. Coast and Geodetic Survey, to serve on the Arbitration Commission on fur seals. In July the commissioners proceeded to the Pribilof Islands in Bering Sea to study the situation on the ground. Poaching on the high seas and in Bering Sea had reduced the fur seal herd to a dangerously low point. The following winter, Dr. J. A.

Allen, of New York, an authority on the Pinnipedia of North America, came to Washington for the purpose of preparing an exhaustive report on the history of fur seals. This history was the basis of the Report of the International Arbitration Commission in several volumes. The Commission decided against the contention of the United States that Bering Sea was a *mare clausum*, and as a result poaching continued until finally terminated by the Treaty of 1910 between the United States, Canada, and Japan.

In 1891 when the National Zoological Park was established in Washington, under the Superintendency of Dr. Frank Baker, Dr. Merriam was much interested in the collection and in fair weather spent nearly every Sunday morning with Dr. Baker in the park looking over the animals and birds. At that time the Zoo had several notable exhibits, including a number of bears, a cage containing eight or nine kea parrots from New Zealand, and a coon tree in which a family of raccoons lived and finally succeeded in denuding the branches and killing the tree. To most persons Dr. Merriam was known chiefly as a mammalogist. His principal publications, including 'Mammals of the Adirondacks,' and monographs of various groups were on mammals. He revolutionized the technique of making study specimens of small mammals, and he emphasized the importance of a uniform system of measurements. In his technique of making skins, he inserted a small copper wire wrapped with cotton in the tail of each specimen to prevent it from being broken off, and he used wooden toothpicks wrapped with cotton in the limbs. The fore feet were pointed straight ahead and the hind feet straight back. The fur was carefully brushed with a toothbrush to bring out the pattern of marking in such forms as chipmunks and spermophiles.

He always signed his name C. Hart Merriam to distinguish his signature from that of his father, Clinton L. Merriam. To members of his family and his intimate friends he was known as 'Hart,' and to his office associates as 'C.H.'

I first became acquainted with Dr. Merriam through correspondence as an observer of bird migration and met him personally in Berkeley, California, in 1888, when he made his first visit to California in company with H. W. Henshaw. When I received an appointment in the Biological Survey and arrived in Washington in November 1889, I found Dr. Merriam interested in four projects: (1) A revision of the meadow mice of the genus *Microtus*, (2) a list of the mammals of North America, (3) a bibliography of mammals, and (4) an index of the generic names of mammals. The revision of meadow mice was completed by Vernon Bailey, the list of mammals of North America

by Gerrit S. Miller appeared in several bulletins of the U. S. National Museum, the publication of generic names was entrusted to me and appeared as North American Fauna No. 23, Index Generum Mammalium, but the bibliography of mammals was never completed.

Dr. Merriam was not an easy writer. He spent hour after hour writing, polishing, and changing sentences in order to convey just the meaning he desired. As an author, he was moderately prolific. His bibliography, as published by Mrs. Joseph Grinnell in the 'Journal of Mammalogy' for November 1943, contains more than 400 titles. For nearly 60 years from 1873 to 1934 a steady stream of notes, descriptions of new species, articles on distribution, and in later years notes on the Indian tribes of California poured from his pen. The greatest number in any one year was 45 in 1897, but there were none in 1911 or 1933. Although he was never a student of the classics or of modern languages, he spent much time in collecting vocabularies of Indian tribes that were on the verge of extinction. His principal works were: 'Birds of Connecticut,' 1877; 'Mammals of the Adirondacks,' 1884; 'Life Zones of San Francisco Mountain, Arizona,' 1890; 'Results of a Biological Reconnaisance of South Central Idaho,' 1891; 'Life Zones of North America,' 1891; 'Monographic Revision of the Pocket Gopher Family Geomyidae,' 1895; 'Results of a Biological Survey of Mount Shasta, Northern California,' 1899; 'Revision of the Grizzly Bears,' 1918; and 'An-nik-a-del, the History of the Universe as told by the Mo-dea-se Indians of California,' 1928. His publications ceased in 1934, and nothing was issued during the last eight years of his life.

Shortly after the new series of 'Science' was started, he contributed comments, notes, and reviews for several years. He never contributed any memorials to 'The Auk' but published elsewhere several rather extended biographies of his friends, including W. H. Dall, G. K. Gilbert, and John Muir.

As an editor he was prone to take his duties too seriously and if he disagreed with the author, to inject his own ideas or explain why he disagreed. This characteristic attracted the attention of Alfred Newton, the English ornithologist, who commented on it in his 'Dictionary of Birds' in a reference to Cooke's 'Bulletin on Bird Migration in the Mississippi Valley.' In preparing the 'Bulletin on the English Sparrow' for the press this characteristic aroused the antipathy of the author, W. B. Barrows. As a reviewer, he was apt to dwell on what the author might, could, or should have done, rather than on what he actually did.

Although he disclaimed any interest in politics, and appearing at hearings before Congressional Committees was somewhat of an ordeal, politics did much for him. It was through politics that provision was made for placing the work on geographic distribution and bird migration on a firm basis in the Department of Agriculture. When an effort was made to eliminate the Biological Survey in 1907, he had the support of the strongest lobby in Washington and under the leadership of John F. Lacey in the House secured the restoration of the Biological Survey and its appropriation. It was through the League of American Sportsmen that the provision for regulating the importation of foreign birds and mammals was enacted into law in the Lacey Act of 1900 and the Biological Survey raised to the status of a Bureau in 1910 through the powerful support of Senator Boies Penrose, of Pennsylvania, one of the leaders in the Senate.

His long friendship with President Theodore Roosevelt was at times somewhat of an embarrassment. In his first message to Congress Roosevelt mentioned Merriam by name. This proved to be a liability rather than an asset, as it aroused the animosity of other officials of the Department of Agriculture. When the President was preparing for his trip to Africa, he summoned Dr. Merriam to the White House and asked him to find a diagram showing the vulnerable spot in an elephant's skull. Because of its density the skull can be penetrated by a bullet only at a point behind the ear. Returning to the office in hot haste, Dr. Merriam asked, "Did you ever see such a thing?" "Yes," I replied, "we have a book with such a diagram." "Give it to me quick," he said, and rushed it up to the White House. The President had the diagram copied on a large scale and set up a target in the basement where he practiced shooting elephants as a preparation for his African trip. During his long and eventful career Dr. Merriam was the recipient of many honors. He was one of the founders of the Linnaean Society of New York, the American Ornithologists' Union, the National Geographic Society, the American Society of Mammalogists, and the Washington Academy of Sciences. He was elected a member of the National Academy of Sciences, the American Philosophical Society, a corresponding member of the Zoological Society of London, and a member of the English Society for the Preservation of the Fauna of the Empire. He served as president of the American Society of Naturalists, Anthropological Society, Biological Society of Washington, Linnaean Society of New York, and American Society of Mammalogists.

Before his death he had the satisfaction of seeing the disposition of his collections and legislation enacted to carry out two of his early

projects. Regulation of the importation of foreign animals was provided by the Lacey Act of 1900, and the Biological Survey given bureau status in 1910. His collection of birds was acquired by the British Museum, his collection of mammals was donated to the U. S. National Museum, his library to the Museum of Vertebrate Zoology of the University of California, and his linguistic studies of California Indians to the Bureau of American Ethnology.

1939 Biltmore St., N. W., Washington, D. C., October 30, 1953.

PLUMAGE ABERRATIONS OF THE REDWING (*AGELAIUS PHOENICEUS*)

BY ROBERT W. NERO

DURING June, 1951, I repeatedly observed an adult male Redwing with a large patch of pink feathers on his throat on a marsh near Madison, Wisconsin. After taking notes on the behavior of this bird, I collected it on June 14. Impressed by its unusual marking I wrote to 28 museums and universities requesting the loan of Redwing specimens showing plumage aberrations. Ninety specimens showing some aberration were obtained from these sources as follows: Museum of Vertebrate Zoology, University of California (19); Chicago Natural History Museum (18); University of Michigan Museum of Zoology (11); Cornell University Laboratory of Ornithology (9); Milwaukee Public Museum (8); United States National Museum (8); Stanford University Natural History Museum (4); Louisiana State University Museum of Zoology (3); State University of Iowa Museum of Natural History (3); University of Wisconsin Zoology Department Museum (2); University of Minnesota Museum of Natural History (2); Carnegie Museum (1); North Carolina State Museum (1); and Yale University, Peabody Museum of Natural History (1). These specimens were collected in widely scattered localities from New York to California, and from Alberta to Mexico (including Yucatan), Costa Rica, and the Bahamas during the course of nearly a century. The series apparently includes examples of 10 subspecies. The various plumage aberrations in this group appear to occur throughout this range without any significant concentration.

During April and May, 1952, I collected 219 adult male Redwings near Madison in an effort to obtain data on the frequency of occurrence of certain of these aberrant features. About 75 of these birds showed these particular traits, and the majority of the others were found to show certain less obvious irregularities. Literature reference to 13 other specimens (of which I have examined 3) gives a total of over 300 specimens showing some plumage aberration. These form the basis for this report.

I wish to thank the ornithologists of 13 institutions for their cooperation in loaning specimens, and those of 15 other museums who kindly checked their collections. Special thanks are due Dr. John T. Emlen, Jr. for many suggestions and for criticizing the manuscript. Wilmer J. Miller, Jerome J. Chart, and Richard A. Hunt aided in various aspects of the study.

"ALBINISM" IN THE ICTERIDAE

Plumage aberrations are common among icterids and have attracted the attention of several previous observers. Deane (1876: 22) wrote: "the most interesting and striking cases of albinism are those among the Icteridae and Corvidae . . ." Kumlien and Hollister (1903: 88) reported that in Redwings "albinistic specimens are common." Edson (1928) records the occurrence of a flock of about 500 Brewer's Blackbirds (*Euphagus cyanocephalus*) in which seemingly 40 per cent of its members showed partial albinism. Various aberrant plumages have been described in the following: Bobolink, *Dolichonyx oryzivorus*, (Gray, 1879; Strecker, 1869); Cowbird, *Molothrus ater*, (Robinson, 1888); Bronzed Grackle, *Quiscalus quiscula*, (Wilson, 1930); meadowlarks, *Sturnella magna* and *S. neglecta*, (McGregor, 1896; Hoffmann, 1878; Robinson, 1888; Townsend, 1883); Yellow-headed Blackbird, *Xanthocephalus xanthocephalus*, (McGregor, 1896).

TERMINOLOGY OF ALBINISM

The term albinism has been generally applied to animals showing some degree of abnormal white coloring or depigmentation. In a more restricted sense, according to Hutt (1949), the term applies to those animals with "more or less elimination of melanin from the eye, as well as from the skin and feathers or hair," still implying, however, a gradation in degrees of albinism. This is complicated by the inability to determine in all cases, without microscopic examination, to what extent depigmentation has occurred (Pearson, *et al.*, 1911–1913). Furthermore, since strict definitive terms requiring knowledge of the genetic basis of the form concerned cannot be freely applied to animals for whom this information is lacking or unobtainable, a general classificatory system is desirable. The factors involved in plumage changes are complex and not well understood in every case. There are records of fowls changing from colored to white, and even back to colored again. Spontaneous development of white feathers (sometimes due to injuries) is fairly common (Hutt, 1949: 182–184). This is also known in wild birds. Frazier (1952), describes depigmentation in a Robin (*Turdus migratorius*) which was originally banded as a normal bird. Breeding experiments would be necessary to establish the exact genetic basis for the Redwing plumage forms described below.

Mueller and Hutt (1941) have arranged and utilized a classification of albinism formulated by Pearson, *et al.* (*op. cit.*) which seems quite satisfactory. *Total albinism* is the condition of complete absence of melanin from the eyes, skin, and feathers or hair. *Incomplete*

albinism is a condition in which the eyes, skin, or feathers are affected, but not all three. *Imperfect albinism* is the partial inhibition of pigment formation in any or all three of these areas, but not total in any. (It is equivalent to dilution as used by many authors.) *Partial albinism* is the complete or partial inhibition within localized areas. Partial albinism in the Redwing may be further considered as *random*, i.e., occurring in dissimilar areas from bird to bird; and *specific*, occurring in approximately the same area in each specimen. All these types have been found in the Redwing.

In a few cases the bills and feet were also affected, but little attention was paid to this condition. In some of the complete albinos and dilutes, bills and feet were paler than usual, and in 2 partial albinistic males some of the claws alone appeared depigmented.

Structural aberrations of the feathers are rare or at least were not apparent. However, two adult males (C.N.H.M. 162,962, M.V.Z. 63,895) had several contour feathers which, besides being white or gray, were rather more soft and hair-like than usual, resembling the condition known in fowls and pigeons as silkiness in which the barbules fail to interlock due to some structural deficiency (Hutt, 1949: 106). Several of the specimens with light primaries and rectrices showed what seemed like an unusual amount of wear, especially on the tips. The effect of differential wear of lighter portions of feathers has been pointed out by Dwight (1900).

TOTAL ALBINISM

Six females in the series are apparently total albinos, i.e., seem to be entirely lacking in melanic pigments. Two are labeled "pink eyed" and a third and fourth were so described in reports by the collectors (Fritz-Henning, 1893; Robinson, 1888). Another, a juvenile, entirely white and mounted with pink glass eyes, lacks data but is the size of a female. The eye color of the sixth specimen is not designated. None of these birds show any trace of the female pattern and in this respect may be differentiated from the dilute type. Carotenoid pigments were apparently not affected in these birds. All except the juvenile have a tinge of "red" on the head, throat, breast, and epaulets. These colors are respectively: Light Orange-buff (head, etc.), and Pale Salmon-orange (epaulets); Light Salmon-orange, Orange Chrome; Pale Orange-yellow, Light Salmon-orange; and Light Orange-yellow on both areas. (Capitalized colors are those of Ridgway, 1912. Throughout the remainder of the paper "red" will be used generally to refer to the appearance of assortments of the above colors.) These specimens show more red color on the epaulets

and throat than do the dilute specimens described in the next section. The variation in the amount of red in these total albinos may be an effect of age. Female Redwings are generally believed to show more red as they increase in age. Dwight (1900: 161) states that "an orange or crimson tinge may show on the 'shoulders' of the older birds." Racial variations also need to be considered. One subspecies, *Agelaius phoeniceus utahensis*, is characterized by an increase in the red pigmentation of the throat area and epaulets of females. Males of this race also show a more intense red on the epaulets than do males of races in surrounding areas (Behle, 1940: 234–235). Dwight (*loc. cit.*) notes further that females in any plumage after the post-juvenal molt may show a pinkish or salmon tinge, especially about the chin and head. Personal experience suggests that females in their first breeding season do not generally show very much of this color. Juvenile birds of both sexes may show it, however. Dwight (*op. cit.*: 160) observed young with pinkish buff and ochraceous in these areas.

Apparently collectors who obtain an albino female Redwing are so struck by the color of the epaulets, which appear much brighter red in the absence of melanin, that they are led to believe they have a male. The "perfect albino" *male* with the "yellowish-pink" epaulets that Robinson (1888) describes, was examined in this study (U.S.N.M. 115,452, September). No specific description of the reproductive organs is given by the collector, but judging by its size (culmen—17.6 mm.) it is questionable whether it is a male. Fritz-Henning (1893) describes a September bird as a "perfect Albino, pure white with the exception of the lesser wing coverts which are a delicate pink; eyes pink. This handsome fellow was with a flock of about 200 Blackbirds, all of normal color. It measured—Length, 8.10; extent, 12.00; wing, 4.00; tail, 3.01; bill, 0.60." I have also judged this specimen to be a female on the basis of its measurements and have accordingly placed these two specimens among the females mentioned above. In another case, a partial albinistic female was similarly mistaken for a male (see below).

White (1896) described as an "albino" a bird which was "pure white with the red and orange on the wings" and stated that it was a male. His observation of the two colors on the wings suggests that this specimen was correctly sexed. Another bird which may have been an albino male was reported by a relatively inexperienced observer who claimed to have seen an all white blackbird with "red wings" in flight during May, 1952, in Fond du Lac County, Wisconsin. I was unable to confirm this observation.

IMPERFECT ALBINISM—(DILUTION)

The most common plumage aberration apparent in female Redwings was a condition resembling dilution. This term has been used to designate specimens showing a pale version of the normal appearance due to a general reduction of pigmentation over the entire plumage (Hutt, 1949:187). *Pale* and *ghosting* have been used synonymously with this term. Hutt considers dilution in the fowl apart from albinism, apparently largely on the basis that dilution affects all pigments (carotenoid pigments may be unaffected by albinism). Since the degree of red pigmentation in the Redwing varies normally, it is impossible to decide whether or not the red has been affected. These pale Redwings may be considered dilutes in the descriptive sense of that word but cannot be strictly compared to dilution in the fowl.

Eleven of the skins obtained from museums may be classified in this category. The normal appearance of streaked underparts in the adult female, resulting from white or gray feathers with a darker central stripe, is changed in the dilute females to paler color, the pattern ranging from a mere trace to a nearly normal appearance (see plate), and the color of under tail coverts and rectrices varies from white to Dark Mouse Gray. The general tone of the contour plumage is Light Buff (7 skins), Light Olive to Grayish Olive and Pale Smoke Gray (2 skins), but in nearly all of the specimens individual feathers are edged with Hazel, Tawny, or Cinnamon-brown. The colors of the head, throat, and breast range from Light Buff and Cream-buff through Olive-brown and Pale Orange-yellow. The epaulet colors are Light Buff and Cream Buff, Smoke Gray, Dresden Brown, Buckthorn Brown, Ochraceous-tawny, Tawny, and Salmon-orange. This variety of colors in the dilutes is presumably partly the result of the presence of varying amounts of melanin.

Three additional dilute females, one described by McGregor (1900: 7), the second by Dwain W. Warner (pers. commun., 1951), and the third which I observed near Madison, conform to this picture. The latter bird was watched in its nesting behavior from May 20 until June 14, 1952. It laid 3 eggs which hatched, but partly due to my interference the young were lost and the bird deserted.

One immature male specimen showing what is evidently the dilution effect was examined. This bird was collected in California (M.V.Z. 90,749). The entire plumage presents a faded picture of the immature plumage, being pale brown in general appearance (Sepia to Mummy Brown) instead of the usual dull black. The breast and neck and especially the top of the head are considerably darker than the

rest of the plumage. The tips of the primaries and tail feathers are especially pale and also somewhat frayed. In some areas on the wings and back, certain feathers show a silver tone. The lesser wing coverts appear Bittersweet Orange and the greater coverts (forming the buff border of the epaulets) are more heavily spotted than usual.

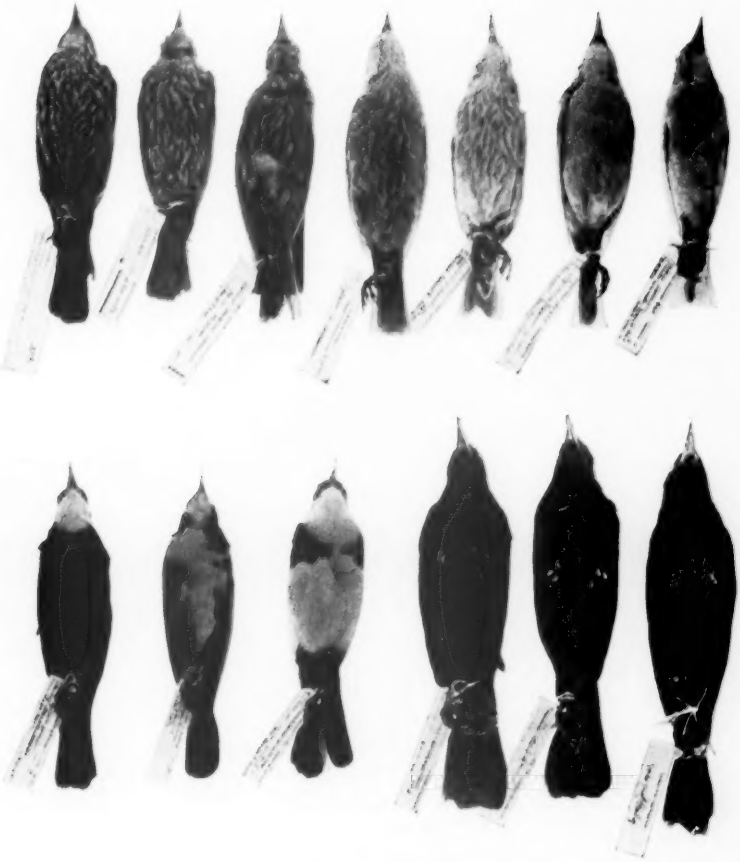
A light-colored male which may have been a dilute was seen in a flock of several hundred male Redwings in Green County, Wisconsin, on November 9, 1952, by Mr. Gordon Orians, an experienced observer. His first impression was that the bird was a total albino, but closer inspection showed it to be "light tan all over." In his opinion, judging by its size, the bird was clearly a male.

The dilution effect is well known in several domestic birds (budgerigars, chickens, turkeys, and pigeons) and has been reported in the Mourning Dove (*Zenaidura macroura*) (Graefe and Hollander, 1945) and the California Quail (*Lophortyx californica*) (Price and Danforth, 1941). In both of the latter cases the specimens were described as showing a pale version of the normal pattern. Breeding experiments were conducted with the quail, and the dilution was found to be due to a single recessive factor which was considered semi-lethal since the dilute young appeared to be weaker. Dilution in the Domestic Pigeon (*Columba livia*) was found to be sex-linked as well as recessive (Hollander, 1938: 23). Any sex-linked, recessive character in birds will appear more frequently in females than in males because the former are heterogametic. The occurrence of 14 dilute females to 2 dilute males in the Redwing suggests that the genetics of dilution in this species may be of a similar nature.

PARTIAL ALBINISM—RANDOM TYPE

This section includes the more striking cases of partial albinism in which large areas of the plumage lack melanin and also those specimens in which only a single white feather occurs.

Cases in which pale feathers tinted with a shade of red appear in adult males are very numerous. Such feathers appear in practically all portions of the plumage but are especially numerous on the more anterior regions, i.e., head, throat, and breast (see "red spotting"—table 1). In specimens lacking melanin in most of the body plumage, the red tinting is clearly seen to increase in concentration in these areas. These tinted areas, as previously mentioned, are the areas in which a reddish cast often occurs in females. The rather constant appearance of red in certain areas in these aberrant males suggests that this color may occur in all individuals, but that it is normally masked by melanic pigments as discussed later.



(*Top*) DILUTE FEMALE REDWINGS. The specimen on the left is a normal old adult from Wisconsin.

(*Bottom, left*) RANDOM PARTIAL ALBINISM IN MALE REDWINGS.

(*Bottom, right*) SPECIFIC PARTIAL ALBINISM: "BREAST BANDING," IN MALE REDWINGS.

I have examined 55 specimens showing a single feather of this sort and 35 others with 2, 3, or more of this type of feather. These feathers occur most frequently near the orbits, often in the orbital circlets or nearby, but they also appear on the throat and breast. Of the 219 adult males collected near Madison, 60, or 27 per cent, showed this character (table 1). Often these feathers were small and barely noticeable except on careful examination. In several cases males had small patches of pinkish feathers, especially near the eyes and on the chin and throat. White feathers lacking any tint of red are very rare on the anterior regions of adult males but appear elsewhere over the entire body as will be shown in the descriptions of certain individuals which follow.

In four of the males, pink or red feathering occurs in extensive patches which are in some cases symmetrically distributed. Three of these specimens are shown in plate 11. The bird on the left has a Light Salmon-orange throat-patch which covers the chin and throat, malar area, and lower two-thirds of the auriculars. This is the specimen mentioned in the introductory paragraph of this paper.

The center specimen is more complexly colored, having several white feathers (median coverts, crown, back, and primaries) as well as the broad breast patch and abdominal patch. The chin and throat bear the deepest Salmon-orange. In this case the patch is less symmetrical and does not cover as much area on the head as in the former specimen. The light area which spreads across the breast and down the ventral tracts is Light Salmon-orange. The abdominal extension is formed by the light feathers of the medial edge of the ventral tracts overlying the sternum. There are more light feathers on the left side than on the right. Nearly all of the white feathers show a slight tinge of Orange-pink, but the color is deepest on the throat, chin, and head. This specimen also has two rows of Light Salmon-orange feathers encircling the nape and occipital region.

In the specimen on the right, both the wings and rectrices are completely white, the throat and breast appear as one colored patch, and the abdominal area is light from flank to flank. Again the throat and chin are the deepest Orange-buff. This color becomes Light Orange-buff on the feathers of the lower breast and throat. A line of Pale Orange-yellow feathers runs from the throat to the occipital region on the right side of the head. This bird also has some of the primaries and rectrices faintly tinged with Orange-pink. The epaulets are Orange Chrome, corresponding with the general color of the tinted areas. This is an immature specimen.

A young male collected in 1950 in North Carolina is described by Harry T. Davis (pers. commun., 1951) as having white primaries in

each wing and 2 white tail feathers, as well as an irregular design across the breast 2¼ inches wide with a projection almost to the base of the tail. The light area of the breast had a "reddish orange" tinge; the belly area, a slight suffusion of "yellow." The epaulets varied from "orange to lemon."

McGregor (1896) depicts a male which has white feathers in the secondaries, rectrices, upper and under coverts, flank, breast, throat, and sides of the head. I examined this specimen (S.U.N.H.M. 6,474) and found it quite as described. The slight tinge of color might be better described as Light Salmon-orange. The epaulets are the normal Scarlet to Scarlet-red. An interesting feature is the apparent alternation of rows of normal and aberrant feathers encircling the body throughout most of its length.

Another adult male showing considerable areas lacking melanin was collected by me on August 2, 1952, near Madison (U.W.Z. 14,329). On the right wing the first 2 primaries, 5 primary coverts, and several feathers at the base of the primary coverts are white. The remainder of the wing plumage is normal. On the left wing all of the primaries, the primary coverts, and the alula and surrounding area are white. There is a patch of pink feathers on the chin and another on the right malar region. There is also a large asymmetric white area on the breast, from the sternal notch to the end of the sternum. Red tinting of these light feathers (largely Salmon-orange) appears in the metacarpal region, faintly on the outer webs of the primaries and coverts, and on the tips of some of the contour feathers of the breast patch. This specimen was taken while in the midst of his molt and lacks many feathers, especially about the head and neck, but this condition permits an examination of the plumage of two seasons. Of the 9 left primaries which are white, for example, the first 3 are of the previous plumage, appearing worn and lacking the red tint. Similarly the first 4 worn primary coverts present a fine contrast to the remaining new coverts. All of the affected areas show tiny new feathers lacking melanin, suggesting that the albinotic condition of this specimen is permanent.

Random partial albinism appears to be of less frequent occurrence in females than in males, but of course would not be as easily detected in the light pattern of the female plumage. One female specimen examined by me showed white feathers in these areas: 8 on the crown, 1 in the left scapular tract, 2 on the left lower throat, and 2 on the right upper breast. Emerson (1902) reported a female with 2 white feathers on each side of the tail, 2 primaries in the right wing, and 1 in the left. Jewett (1910) listed a female with 3 or 4 white primaries in the left wing.

One might infer that the "albino" described by Littlejohn (1901) was a male, since he stated that the epaulets were paler than normal and that the tail feathers were black. However, I have examined this specimen (S.U.N.H.M. 7,559, August), and although it is labeled male, have judged it to be a female on the basis of its plumage and size (culmen—17mm., wing—101mm.). He has described the specimen fairly well, stating that nearly the whole body was white except for half a dozen feathers on the breast and in the middle of the back. The top of the head and the wings were described as being nearly normal. He also noted that there was a "rosy hue" on the breast and throat (Light Salmon-orange). An important feature in this specimen is that half of the feathers of the epaulets are aberrant and half are normal. The distal lesser secondary coverts are of the normal diffused chestnut appearance (really dark brown feathers edged with chestnut), but the proximal half of this series of feathers lacks the dark color and streaking and is Bright Orange Chrome to Flame Scarlet, showing plainly the effect of masking of red pigment by the darker melanic pigment.

The occurrence of red on the outer web of the primaries of some of the "white-winged" specimens leads to an interesting point. As previously mentioned, the male collected at Madison in August, 1952, had some white primaries from a previous molt and others from a recent molt. Only the recent feathers showed the red tinge on the margin of the outer web. The remaining normally pigmented primaries (black) showed the "brown" margin of the fall plumage. The edges of these feathers (as well as the tips of the body feathers which show this fall pattern) appeared not so much "brown" as "red" (Salmon-orange) when viewed under a binocular microscope. Thus a visual examination leads me to attribute the color of these feather edges to a carotenoid pigment rather than a melanic pigment. The red on the margins of the white primaries may be partially masked by melanin in the normal plumage to produce the light edging which characterizes the fall plumage. On this basis one could expect that an albino male collected shortly after the assumption of new plumage would show more red color on the edges of the primaries, etc., than would a late spring or summer specimen, because the light edges assumed in the post-nuptial molt normally have disappeared by spring.

PARTIAL ALBINISM—RESTRICTED TYPE

Breast Banding.—A character which appears in adult males as a nearly concealed band of white-marked feathers across the breast

has been found in 22 specimens obtained from museum collections. This same character was found to occur in 24, or 11 per cent, of 219 adult males collected within 60 miles of Madison, Wisconsin (table 1). Its appearance in specimens from Canada, Yucatan, and Costa Rica, and from New York to California, shows that it has a widespread occurrence. Whether the 11 per cent figure is general over this area remains to be determined. Three specimens showing this character are shown in plate 11. Considerable disarrangement of the breast feathers of the pictured birds was necessary to reveal the white-marked feathers, and in none of the specimens are all of the white-marked feathers apparent. In most museum specimens, and in nearly all fresh specimens, the majority of the marked feathers are concealed by overlapping feathers. Undoubtedly more specimens showing this character could be found in collections if a closer examination were made.

In prepared specimens the band across the breast often appears more posteriorly than on the fresh bird. Actually the marked feathers usually occur along the ventral tracts on the upper breast from about shoulder level to 10 to 35 mm. posteriorly (measuring from the base of the feathers). Generally the number of marked feathers on each ventral tract is about equal, but in a few cases it is not. In some cases these feathers are limited to the medial edges of the ventral tracts; in others, to the central portion; and in some extensive cases cover the entire width of the tracts. The actual number of feathers on each tract generally varies from 3 or 4 to 50. One specimen was found with only a single feather of this same type. The general effect may be a crescent or a wide band across the breast.

The white area on each feather is subterminal rather than terminal and is thus generally concealed by the overlapping plumage. This white marking somewhat resembles "barring" in fowl, in which a sex-linked gene inhibits the deposition of melanin within the individual feather, causing a white bar on a feather that would otherwise be all black (Hutt, 1949: 202–203). In the breast banding, however, the white area occurs nearly always on only one web of each feather—generally on the lateral web—and does not always extend to the edge. It is this peculiar asymmetry which is most characteristic of the trait. A similar asymmetry has been reported for the condition known as "spangling" in the Silver Spangled Hamburg chicken (Landauer, 1930: 81). In these birds individual feathers over much of the plumage are white and tipped with black which is more extensive on the medial than the lateral web of each feather.

In the Redwing the extent of the light marking varies from large

areas extending from the shaft to the edge of the vane to a mere trace bordering the rachis. Feathers with larger white areas are usually located medially and posteriorly to the others. Rarely they may be anterior to the feathers with the smaller markings. In many specimens all or most of the marked feathers may show a similar-sized area. Often the very narrow light area bordering the rachis requires careful scrutiny to be detected. In the examination of the fresh specimens it was found that it could be best detected by looking at the underside of the breast feathers.

Although in most cases the light area occurs on one web only, in a few specimens it extends over both webs. In one unusual specimen (C.N.H.M. 29,570) a broad light area occurs on both webs of nearly all the marked feathers and also extends to the margin of the web. In many of these feathers the distal part of the light area has worn away, leaving a bare shaft for 1–2 mm. between the light area and the small dark tip which is not as worn.

Occasionally a few marked feathers also occur on the ventral tracts anterior to the shoulder joint, some reaching to at least the middle of the neck. In these cases especially there is likely to be found a reversal of the position of the light spot from the lateral web to the medial. A similar reversal of asymmetry is found in the spangled fowl. Landauer (1930) stated that of the throat feathers on the *left* body side of the fowl almost all the feathers near the median line have spangles with the right symmetry type, i.e., they are darker on the lateral web rather than on the median web. Landauer has further shown that in the fowl the per cent of feathers with the opposite spangle type increases with the distance from the median line.

Eight specimens in the series show a tinge of Salmon-orange on the white areas, particularly near the black tip. In the other albinistic forms the red color is more or less limited to the distal third of each feather.

Although it appears that in most specimens the breast banding was concealed, some of them have extensive markings which might have been visible on the living bird. Hackett (1913: 37) observed a live male in the field which had an "abnormal light spot on the breast" which might have been of this kind. It seems likely that the following reported specimens were also of this type. Brewster (1868) collected an otherwise normally plumaged male which had a "crescent-shaped mark, of a bright orange color on the breast; this was about equal in size and form to the half of an old-fashioned copper cent." And Kumlien and Hollister (1903: 80) noted "two or three specimens with a pink crescent on the breast."

Possibly populations of Redwings may be located in which this character appears in higher frequency and in which it might be investigated genetically. Under isolated conditions a recessive gene character might appear in higher frequency. Edson (1928) suggests this as a possible cause of the appearance of a flock of Brewer's Blackbirds with a high number of white-spotted members. Hanson (1949: 170) states the same for Canada Geese (*Branta canadensis*) showing large numbers of white-spotted individuals in flocks migrating through Illinois.

So far there has not been found any female or immature male showing this character. It is possible that it is expressed only in the adult male, but it is also possible that it has been overlooked due to the generally lighter and streaked plumage of the females and the dull plumage of the immature males. Also there were fewer specimens of this kind available for study.

Metacarpal Red.—The red or orange color of the epaulet of the male often extends along the edge of the wing to the base of the alula. Thus the small feathers covering the base of the alula are often red, a feature which is sometimes noticeable even in the field. However, the appearance of red color on the small feathers beneath the alula, i.e., overlying the metacarpals and digits, and particularly along the edge of the wing as well as on the underside in this area, seems to have been largely overlooked, although Coues (1903: 469) wrote that "occasionally, there are traces of red on the edge of the wing and below." This condition was first brought to my attention in the aberrant specimens which lacked melanin in this area, for in them the small metacarpal feathers were quite noticeably red, much as in the epaulet. Forty-three, or 20 per cent, of 219 males showed this character (table 1).

The greatest amount of metacarpal red feathering was observed in 3 birds which had some white wing feathers. In one (plate 11, bottom row, second from left) the metacarpal feathers are nearly all red, although the remainder of the wing plumage is white. However, there is no sign of red on the corresponding feathers of the other wing, which is the usual black. The specimen immediately to the right of this bird on the plate has red metacarpal feathers on both of its otherwise white wings (excepting the epaulets). A third specimen collected during the study also has very noticeably colored metacarpal feathers. On the left wing, of which all the primaries and the area including the alula lack melanin, the metacarpal feathers are all Bright Salmon-orange excepting one which is the normal black. On the right wing, only the first 3 primaries and the distal portion of the metacarpal

area lack melanin; the alular feathers and the rest of the wing feathers are black. However, that portion of the metacarpal area which does lack melanin is Salmon-orange.

These facts strongly suggest that red pigment normally persists in the metacarpal area masked by black pigment. This is further supported by evidence from normal birds. In normal specimens, i.e., not generally albinistic, this area is usually black, but some individuals show a trace of red on a few of the metacarpal feathers, particularly along the edge of the wing. In some cases the black feathers have red tips, often very slight but occasionally larger; and sometimes even the entire feather may be red. The red also occurs asymmetrically and in these feathers is usually on the lateral web. In some cases, red feathering may extend to the underside of the wing in this area and even from there to the epaulet. Juveniles and immatures of both sexes sometimes show a slight amount of red on the tips of these feathers, but in the majority the tips are buffy or gray. Females ordinarily have light-tipped metacarpal feathers, and in those birds showing greater amounts of red in the epaulets the metacarpals are plainly tipped with red.

Species which have bright colors, such as red or yellow, in some limited area of their plumage often have these colors repeated in the feathers of the metacarpal area, e.g., Eastern and Western meadowlarks, and White-throated Sparrows (*Zonotrichia albicollis*). The Rose-breasted Grosbeak (*Pheucticus ludovicianus*), and the Scarlet Tanager (*Piranga olivacea*) show considerable red in this area of the wing in sub-adult plumage, and usually this part of the adult plumage is all black, but in a few Scarlet Tanagers I have found red feathers scattered among the black. This is also the case in the Yellow-headed Blackbird and is especially interesting here because in this form many of the feathers surrounding the metacarpal area are normally all white.

White Belly-spot.—Males, females, and immatures often show a tendency for failure of melanic deposition in a tuft of small body feathers in the middle of the belly. This small group of white feathers is always concealed by the large contour feathers of the ventral tracts. However, when the latter are blown apart this spot can be readily discerned, at least on fresh specimens. Usually it is lost or rendered difficult to see in the process of preparation. This group of white feathers occurs most frequently over the posterior centimeter of the sternum, but also occurs posterior to this, on the abdomen. It is practically always in the midline. It ranges in extent from a few feathers to a dozen or more, in one specimen covering an area 15 × 15

mm., and in another covering most of the belly. Of 219 adult males, 51, or 23 per cent, had this character (see table 1). No correlation with age was found in four live banded birds examined in the field.

White Tail-base.—Another unpigmented area frequently occurs on the base of the rectrices. This area is, of course, ordinarily concealed by both sets of tail coverts and can only be seen by lifting these. The condition is not easily observed in prepared specimens, but the series of adult males collected during this study provided an opportunity for an analysis of this trait. The amount of light area is not always the same on each feather and is also asymmetrical, the median web showing the most white. This appears to depart from Landauer's rule for asymmetry described under *breast banding*, but the rectrices are in the median plane where reversals of asymmetry may occur. The entire pattern of white formed by the several tail feathers is usually symmetrical but not always so, and in such cases it is usually the central feathers which show the most white. A sample of 166 adult males yielded 146, or 88 per cent, showing some white on the base of the rectrices (table 1).

A measurement of this white area was taken with a metric rule pushed under the coverts to the base of the tail. Only the length of the light area measured from the tail base was used. Of 127 males measured, 11 per cent had a white area 1 to 5 mm. long; 29 per cent, 6 to 10 mm.; 42 per cent, 11 to 15 mm.; and 12 per cent, 16 to 20 mm. Two birds had white areas between 21 and 25 mm., and four birds, over 25 mm.; these longest areas, however, were mainly on one or two central feathers.

Both immature males and females also show an apparently similar condition, but insufficient numbers of these were collected to permit a comparable analysis.

In the supposition that age might be a factor influencing the extent of the white area, I examined two skins and four live adult males of known age, but found no correlation with age. A bird three years old had a white area 14 mm. in extent; another one of at least the same age had no white. A five-year-old bird had 25 mm.; another of at least the same age had no white. A six-year-old bird had 13 mm.; and an eight-year-old bird (possibly older) had 20 mm. Six caged individuals and one wild bird which had from 5 to 20 mm. of white on the base of the rectrices each showed a similar amount after a normal molt. This also suggests that this trait is constant and permanent, thought perhaps only somatic.

One wild male had a single pink feather in approximately the same position on his head in 2 successive seasons. Similar observations on other aberrant birds would be informative.

DISCUSSION

Frequency of Occurrence.—Table 1 shows the frequency of occurrence of 5 traits in adult male Redwings collected at random within a 60 mile radius of Madison, Wisconsin, from April 6 to May 24, 1952. A statistical analysis showed a significant negative association between white tail base and metacarpal red. The former appeared less frequently in those specimens which showed metacarpal red than in the rest of the sample. This relationship should be investigated further. No other association was apparent. Of 166 males thoroughly examined only 6 lacked one or the other of the above characters. On this basis, 96.4 per cent showed some deviation from the wholly dark plumage (excepting epaulets).

TABLE 1

FREQUENCY OF OCCURRENCE OF FIVE PLUMAGE TRAITS IN ADULT MALE REDWINGS

Trait	*Sample*	*Number*	*Per Cent*
"Red Spotting"	219	60	27
Breast Banding	219	24	11
Metacarpal Red	219	43	20
White Belly-spot	219	51	23
White Tail-base	166	146	88

It would be interesting to know whether similar plumage conditions exist in other species. I examined a small series of adult male Tricolored Redwings (*Agelaius tricolor*) and found some red feathers on the heads of a few. Species with solid coloring, such as male blackbirds, would, of course, be easiest to examine. A few quantitative studies have been made on the occurrence of plumage aberrations in wild birds. The Micheners (1936) reported that of 30,000 birds of various species (excluding House Sparrows, *Passer domesticus*) handled during banding operations, only 17, or about 0.05 per cent, showed any albinism. The Micheners seemed to feel that this represented a fair approximation of the amount of albinism in wild birds. Hicks (1934) examined 10,000 European Starlings (*Sturnus vulgaris*) and found only 11, or 0.1 per cent, with white feathers. It seems probable that slight degrees of albinism could be shown to occur in greater percentages in these species if more detailed examinations were made.

Evidence of Masked Red Feathers.—One of the more interesting revelations disclosed by these studies of aberrant plumages is the appearance of "red" color in certain areas of the plumage where it is usually masked by darker pigments. The "red" or "orange" color

seen in albinistic Redwings appears to be not in itself an aberration, but a character of regular occurrence normally masked by heavier black pigment. Test (1942) has shown that in flickers (*Colaptes*) red, yellow, and orange carotenoid pigments may be concealed by melanic pigments. He states (*op. cit.*: 371) that "in the malar feathers of the males of some kinds of flickers the red pigments are completely masked by melanins."

The areas in which red appears to be masked by black in Redwings, as previously mentioned, are chiefly the head, throat, breast, and metacarpal area. It is of interest to note again that normal old females as a rule have red in these same areas. And again we note that young of both sexes may also show a tinge of similar color in these areas.

An attempt was made to show the presence of "red" pigment in the black feathers of a series of adult male Redwings by extracting pigments with a weak solution of NaOH and examining the extractions with a Beckmann spectrophotometer. Extractions were made from the epaulets, primaries, tail feathers, and head and breast feathers. The results, though far from conclusive, seem worth presenting and may serve as indications for further analysis. The color of the extract from the epaulets covered the range from yellow to red with an apparent preponderance of pigment in the yellow range. This suggests that the observed color of the epaulets is due to a combination of pigments. Extracts from both the primaries and rectrices, and head and breast feathers, showed a slight amount of yellow pigment in exactly the same range. This shows that there is some colored pigment masked by black in several of the body feathers just as Test (1942) has shown to be the case in flickers. The "red" colors of the breast feathers, etc., in aberrant Redwings probably consist of some portion of the array of pigments present in the epaulets. A similar situation probably accounts for the diversity of pigmentation of the epaulets of immature male Redwings. Test (*op. cit.*) has shown that the red, yellow, and orange colors of flickers consist of various mixtures of carotenoid pigments.

What significance the concealed red areas may have is largely a matter of speculation. One is tempted, however, to draw comparisons with related South American blackbirds which show red or yellow pigment in these areas, such as *Agelaius icterocephalus* which has a yellow (Lemon Chrome) head and breast, and *Agelaius ruficapillus* which has a reddish-brown crown and throat patch. Many other icterids have red and yellow pigmentation over much of their plumage.

Behavior of Abnormally Plumaged Birds.—The scarcity of observations of the behavior of abnormally plumaged birds has been pointed

out by Lee and Keeler (1951). They conclude, however, that "certain pigment variations in birds possess correlates in the modification of morphology, physiology, and behavior . . ." Signs of morphological and physiological correlations were most apparent (defective vision, lessened activity, etc.). Behavioral correlates were largely in degree of wildness. Several albinistic birds were noticeably tamer than their normal fellows, but a few (other species) were more shy and more wild. Two appeared as the leaders of their respective flocks.

There is a possibility that unusual behavior patterns in some abnormally pigmented birds may be *acquired* in the course of acceptance or active rejection by others of their kind.

I had observed the "pink-throated" male which I collected in June, 1951, for a period of several days preceding that date. No unusual behavior of any kind was noted. He held a territory which he defended with normal song and threat against neighboring Redwings and a Yellow-headed Blackbird, and he had two mates who each had successful nests. The dilute female Redwing observed at Madison in 1952 nested successfully. This would seem to indicate normal behavior and acceptance by her kind. At times she seemed more wary than other females, but this is a difficult thing to assess. Another of the dilute females, a fairly dark-plumaged bird (Y.U.,P.M.N.H. 3,553), had this notation on the label: "one of large flock, chased a long time before taken. The other birds were trying to drive this one out of the flock."

[On September 7, 1953, in northern Illinois, Mr. David Skaar, a competent observer, watched what seemed to be a complete albino female Redwing "among an immense flock of Redwings gathering in a marsh at sunset. Other Redwings (all males) appeared to be chasing it repeatedly. It would twist and turn attempting to evade them, but always returned to the flock."]

Evenden and Storm (1950) reported an "albino" Barn Swallow (*Hirundo rustica*) which was "constantly chased by the other swallows." In another case (de Balsac, 1951), two young, almost completely albinotic birds of the same species, although apparently ignored by their fellows when perched, were not permitted to join the flock. Whenever they attempted to join, the other swallows would give alarm cries and several would pursue them until they left the vicinity. The albinistic birds, in spite of their gregarious instincts, were compelled to remain in isolation. The same observer reported a domestic hen which had frizzled feathers and which was so persecuted by the other hens that it had to hide during the day and came out only in the evening to get food.

SUMMARY

1. Plumage aberrations, mostly in pigmentation, were found in over 300 Redwings. Ninety aberrant specimens of both sexes were obtained on request from 28 museums. Descriptions of 13 specimens were found in the literature. Practically all of 219 adult males collected near Madison, Wisconsin, in 1952 were found to show some deviation from the wholly black plumage.

2. These aberrations have been classified as: total albinism; imperfect albinism; partial albinism—random and specific. The forms within these categories have been described in detail, and the frequency of occurrence of several of them in a sample of 219 is shown.

3. Considerable evidence was found suggesting that "red" pigment normally occurs in the anterior regions especially of the adult male Redwing where it is masked by black pigment.

4. The behavior of abnormally plumaged birds is discussed.

LITERATURE CITED

BEHLE, W. H. 1940. Distribution and characters of the Utah Red-wing. Wilson Bull., 52: 234–240.

BREWSTER, W. 1868. A variety of the blackbird. Amer. Naturalist, 2: 217–218.

COUES, E. 1903. Key to North American Birds. 1. 5th. ed., rev. (Dana Estes, Boston), 535 pp.

DEANE, R. 1876. Albinism and melanism among North American birds. Bull. Nuttall Ornith. Club, 1: 20–24.

DE BALSAC, H. H. 1951. Comportement d'oiseaux normaux envers des mutants. Alauda, 19: 225–226.

DWIGHT, J., JR. 1900. The sequence of plumage and moults of the passerine birds of New York. Annals N. Y. Acad. Sci., 13: 73–360.

EDSON, J. M. 1928. An epidemic of albinism. Auk, 45: 377–378.

EMERSON, W. O. 1902. A partial albino. Condor, 4: 46.

EVENDEN, F. G., JR., and R. M. STRONG. 1950. Albinistic Barn Swallow in Benton County, Oregon. Murrelet, 31: 11.

FRAZIER, F. P. 1952. Depigmentation of a Robin. Bird Banding, 23: 114.

FRITZ-HENNING, C. 1893. Notes from Boone, Iowa. Ornith. and Ool., 18: 143.

GRAEFE, C. F., and W. E. HOLLANDER. 1945. A pale mutant Mourning Dove. Auk, 62: 300.

GRAY, A. F. 1879. Albino Bobolink. Science News, 1: 304.

HACKETT, N. L. 1913. Notes on the breeding habits of *Agelaius phoeniceus*. Wilson Bull., 25: 36–37.

HANSON, H. C. 1949. Notes on white spotting and other plumage variations in geese. Auk, 66: 164–171.

HICKS, L. E. 1934. Individual and sexual variations in the European Starling. Bird Banding, 5: 103–118.

HOFFMANN, W. J. 1878. Remarks upon albinism in several of our birds. Amer. Naturalist, 12: 474–476.

HOLLANDER, W. F. 1938. Inheritance of certain "blue-black" patterns and "bleached" colorations in the Domestic Pigeon. Genetics, 23: 12–27.

HUTT, F. B. 1949. Genetics of the Fowl. (McGraw-Hill, New York), 590 pp.
JEWETT, M. 1910. Recent albinos from Illinois and Michigan. Auk, 27: 91–92.
KUMLEIN, L., and N. HOLLISTER. 1903. The birds of Wisconsin. Bull. Wis. Nat. Hist. Soc., 2: 1–143.
LANDAUER, W. 1930. Studies on the plumage of the Silver Spangled Fowl. III. The symmetry conditions of the spangled pattern. Bull. Storrs Agr. Expt. Sta., 163: 71–82.
LEE, FANNY, and C. E. KEELER. 1951. Pigment variations and their correlates in birds. Auk, 68: 80–85.
LITTLEJOHN, C. 1901. Two albinos from San Mateo Co., Calif. Condor, 3: 16–17.
MCGREGOR, R. C. 1896. Albinos. Nidiologist, 3: 94.
MCGREGOR, R. C. 1900. A list of unrecorded albinos. Condor, 2: 86–88.
MICHENER, H., and JOSEPHINE R. MICHENER. 1936. Abnormalities in birds. Condor, 38: 102–109.
MUELLER, C. D., and F. B. HUTT. 1941. Genetics of the fowl, sex-linked, imperfect albinism. Journ. Hered., 32: 71–80.
PEARSON, K., E. NETTLESHIP, and C. H. USHER. 1911–1913. A monograph on albinism in man. Draper's Co. Research Memoirs, Biometric Series 6, 8, and 9. Dulau, London.
PRICE, J. B., and C. H. DANFORTH. 1941. A persistent mutation in the California Quail. Condor, 43: 253–256.
RIDGWAY, R. 1912. Color Standards and Color Nomenclature. (The author, Washington, D. C.), 43 pp.
ROBINSON, W. 1888. Notes on some albino birds presented to the U. S. National Museum, with some remarks on albinism. Proc. U. S. Natl. Mus., 11: 413–416.
STRECKER, H. 1869. Albinism in birds. Amer. Naturalist, 2: 491–492.
TEST, F. H. 1942. The nature of the red, yellow, and orange pigments in woodpeckers of the genus Colaptes. Univ. Calif. Publ. Zool., 46: 371–389.
TOWNSEND, C. H. 1883. Some albinos in the museum of the Philadelphia Academy. Bull. Nuttall Ornith. Club, 8: 126.
WHITE, G. S. 1896. Two more albinos. Nidiologist, 4: 21.
WILSON, E. S. 1930. Interesting case of albinism. Auk, 47: 419.

University of Wisconsin Zoology Department, Madison, Wisconsin, March 20, 1953.

BIRD RECORDS AND THE A.O.U. CHECK-LIST RANGES

BY E. M. REILLY, JR.

SINCE June, 1948, the author has been engaged in plotting ranges of North American birds under the direction of Dr. Alexander Wetmore, Chairman of the Committee on Classification and Nomenclature of the American Ornithologists' Union. In the course of this work the extensive material from the files of the Fish and Wildlife Service's Patuxent Research Refuge at Laurel, Maryland, assembled over a period of many years, has been made freely available through the courtesy of Dr. John W. Aldrich in charge of the Service's Section of Distribution of Birds and Mammals and with the assistance and kindnesses of Mr. Arnold Nelson, Director of the Refuge, and Mr. Chandler S. Robbins.

The file consists of clippings from a large percentage of the ornithological books and journals and countless unpublished observations of hundreds of cooperators, both professional and amateur. Many notes have been laboriously copied by hand from works too valuable to clip, others have been photostatted. The material includes therefore the most complete set of records that have been assembled dealing with the distribution, migration, and abundance of North American birds. In addition the writer has consulted many references from the Library of Congress and from the library at Cornell University, where much of the work has been carried on in the Laboratory of Ornithology of the Department of Conservation. Despite the large quantity of data available there have been many difficulties in interpretation imposed by very uneven quality of the data.

In the attempt to plot scientifically accurate modern range maps for our birds using these records, three main difficulties have been encountered: 1. The ranges of many of our birds are not static but are steadily if slowly changing. 2. The ranges are plotted from a network of observations of ornithologists, which is very irregularly spaced both geographically and in time. 3. Many of the records, both sight and specimen, are not as reliable as they might be.

Concerning the first difficulty, nothing can be done but to revise periodically the maps and lists. The second can be adjusted only by interpolation and time. As for the the third, I hope that by pointing out some of the more common errors in method or in fact that I have encountered while plotting ranges, these may be corrected in the future.

In plotting the ranges, both sight and specimen records are used. The museum specimens furnish the framework; and the sight records, other details. If these two complement each other a fairly reasonable plan emerges—but, often, if all records were taken, a monstrosity

would arise. Fortunately the deviations due to error generally are obvious and can be corrected immediately. The less obvious errors are often compounded before they are discovered. Since sight records are more subject to error than specimen records and are, generally, unconfirmable, they have received more than their share of adverse criticism from many quarters. In using sight records to portray parts of ranges more accurately, some method, aside from the experience of the reporter, had to be devised.

Sight records should be most reliable during the breeding season when colors and patterns, particularly of the males, are most distinctive. When commencing this task much credence was placed in observations made during this period, and it was assumed that if an observer listed a bird as breeding in a particular area he was most likely correct. Granting that specific identification was correct, one must consider the criteria used by the observer in determining the actual status of the species in the area. Frequently the sole criterion is a record of one bird seen at a time assumed by the reporter to be the breeding season for that particular species! Seeing the nest in use is a definite breeding record. Other data only indicate, at best, a probable nesting. Records of both male and female seen through a considerable portion of the nesting season constitute very probable breeding records; one bird seen on one day does not. A bird carrying nesting material is a good indication of breeding, but no more. One singing male may indicate *possible* breeding, but the significance of this evidence is dependent on the species in question and other factors. Very recently fledged birds being fed by their parents are an excellent indication of local breeding, but immatures being fed by adults are not necessarily so.

Further complications are noted in those regions where some ornithologist has published a local list of "breeding species," often on the basis of a short-term visit. The amateur, who may be reporting to the Fish and Wildlife Service, will often use such a list as a basis for reporting certain species as breeding year after year, when in fact, as shown by dates of appearances, the bird is more probably a migrant or wanderer. That the bird may nest sporadically in the area is possible; reporting it as a regular breeder on flimsy evidence obscures this important scientific fact.

Few sight records which appear in print are retracted, no matter how obvious an error; this is possibly because of the embarrassment caused by such retractions. A misidentified skin causes less embarrassment, as here the *mistake* is sooner or later discovered; when sight records are questioned, the originator often seems to think that his

honesty is being questioned. Compilers are frequently asked why they doubted the word of this or that observer and of others. When a sight record is discarded in compiling the ranges for the Check-List no doubt of the recorder's honesty is ever expressed or implied. The expert and the beginner may make the same error on the sight record, but the beginner is more likely to commit himself publicly. The trouble here is that often we tend to greet such errors, when proven, with laughter and ridicule instead of more proper patience.

In reading the literature, we find many questionable records which the recognized experts of today made in their youth; it is obvious that these experts would not publish the same things today. It is the constant published repetition of questionable reports year after year which gives rise to an odious reputation, rather than a few mistakes made in the beginning.

One of the obstacles to the perfect understanding of any report is the use (or misuse) of language. For obvious reasons some of the records on file at the Fish and Wildlife Service are not clipped from the books but are transcribed by hand. Where an author states that "a specimen was seen singing . . ." it has often been written on the file cards as "specimen" with date. Usually specimens are found only in museums. There are many more appropriate words which may be used in referring to living birds than the word "specimen" which should be confined to the dead bird.

It should be pointed out here that errors in transcription are not the sole province of the Fish and Wildlife Service which, in fact, does the work with a remarkably low percentage of such mistakes. Far more common and injurious are the misquotations in literature. Many times an author has cited another author as the source of a *breeding* record when, in fact, the writer cited only reported a summer sight record. In one case a species was listed in four separate papers as breeding in an isolated spot some 200 miles south of its normal range. Each paper cited an earlier paper till in the fifth and earliest paper in the chain the original quotation was found to read, ". . . these birds seemed to be contemplating nesting here." This type of mistake makes it necessary for the compiler to trace each such record back to its original source in order to be accurate.

Other points of confusion arise in the use of purely comparative terms as: common, rare, casual, accidental, etc. All these may be used relative to all other birds, relative within the one species, relative to the time of the year, etc. Actual numbers are best used but too infrequently obtainable. If numbers are not used, all such relative terms should be clearly defined in the report. In the Check-List

work, numbers are not obtainable or practical so such terms are used in relation to the species itself, but, even here, the use of the adjective "common" seems out of place in describing a species such as Bachman's Warbler.

Some purists have recently confused usage which was formerly quite clear. The term "summer resident," for example, is not completely accurate, but even more confusing is the use of the term "summer visitant" in its place to describe a breeding species. Visitant has been used in ornithological literature to denote a wandering individual; thus summer visitant indicates, to most observers, wandering unmated young or adults straying after their regular breeding season elsewhere is over. Why not simply use the very accurate word "breeds"?

Many authors have been using trinomials in reporting sight records simply because a certain form is taken most often in the area or is *supposed* to be found in the area. If these records are transcribed, as mentioned above, as specimen records, much inaccuracy may result. Even without the possible error added in transcription, the use of trinomials should indicate that specimens, accurately determined by a taxonomist, repose in some museum. Very few subspecies can be certainly identified in the field and, even in the cases of these few, there is much chance of error. There is a harmful effect which results from this slipshod use of scientific categories because many workers, both amateur and professional, do not understand the full meaning of subspecies. Many apparently assume that sharp morphological differences and distinct geographical boundaries exist between subspecies. Data indicating the width of the areas of intergradation are much confused by this arbitrary assigning of sight records to subspecies. Many professionals, not taxonomically minded, have assigned specimens in their collections to subspecies on the same assumptions without using comparative material.

One can hardly defend the use of sight records for defining ranges and in the same paper, as has been done, make sight identifications to subspecies of the birds in an area. If trinomials must be used it should be clearly indicated, "*Turdus migratorius* probably subspecies *migratorius*." The use of common names to designate subspecies is to be decried in the same way. Such common names in popular use by the untrained amateur can only result in confusion and make necessary a synonymy of common names, because amateurs make vast and valuable contributions to our literature.

It is possible to be invited into the field to observe a subspecies not known in one's home region. This experience would be fine if it were possible to note some difference in morphology, habit, habitat, or song

between the two forms, but this is seldom possible. What good is a series of names, the very listing of which implies that differences were noted, when no differences were observed? This accent on subspecies in the life list has led to a lamentable number of worthless and confusing records in literature.

A peculiar fact noted in plotting spring and, particularly, fall migrations, those periods when much uncomfortable weather prevails, is that some species breeding commonly in the northeastern states are listed as rare to very rare migrants throughout the entire tier of southern states. These species must cross this tier somewhere in considerable numbers. Quite possibly this anomaly might be explained by factors such as: night migration, too few observers in the area, or birds flying over generally inaccessible terrain; but more likely bad weather keeps the observers indoors. One would not expect that the fall flight, when the bird population is swollen by the young of the year, would be smaller than the spring migration, but such may be indicated by the plottings. There may be a Gulf Coast hiatus, but I doubt that it covers the entire southern states. We definitely need more bad-weather and fall observations.

Almost every time a species is seen and reported in literature from some area outside its natural range, the author of the note seems to feel that the note must be accompanied by a wealth of details about the observer's field experience, the type and size binoculars used, the ground cover, descriptions of other species with which the bird in question could have been confused (but wasn't) and the description of the bird seen. Many of these reports very apparently contain quoted descriptions from Peterson, Chapman, or others without giving credit, when the reporter should have quoted his own field notes. Seldom does one see actual field notes used as the basis for identification. The record may be perfectly valid, but the method of presenting the evidence taxes credulity. Such a note should contain the species name and the date seen, the observer's name, the locality, notes which indicate the proper identification was made, mention of song or call notes if these aided in the identification, weather, feeding notes, and other comments which may have scientific value.

The editors of ornithological journals cannot be expected to check the validity of each statement in each note. It is up to the author to check each item in his note before submission. One annoying, but not too serious, shortcoming is found in those frequent notes in which a bird's appearance is described as the first record for the region. Proper use of the indices to the major journals would have shown, in many cases, that the writer had the second or third "first" record

Apparently many writers rely on word-of-mouth information on this point, and this is a shaky procedure.

If a bird appears for the first time in a place well outside its usual range, it is best to collect it. Indiscriminate collecting is not to be condoned, but certain facts should be pointed out to those who decry collecting of stray individuals. Authentication of the record is only one consideration. The bird has wandered for some cause: climatic, physiological, or psychological; were it collected and preserved in alcohol or formalin it might be possible to discover the reason by anatomical or histological study. If we could find out why one bird wandered far off its course, we might have additional clues to the riddle of migration. One bird well out of its normal range is not likely to start an extension of the breeding range. A stray individual way out of its range will probably not survive long in the alien territory, particularly if out of season. In both cases the bird dies, so science is better served by having the bird collected and saved as a specimen. For various reasons very few sight records of accidentals can be used in the Check-List ranges.

In plotting the ranges for the A.O.U. Check-List many state and local lists are used. In general these lists are complied by local ornithologists who have the advantage of knowing the countryside and the local observers. These lists should be invaluable. That these lists are not always helpful has been a sad discovery. One trouble arises because they use so many local place names which are impossible to locate in standard gazeteers or atlases or on maps available to researchers. Not enough local lists include gazeteers of the area covered and some have maps which are far from adequate. Townships are not included in many atlases and, further, their boundaries are subject to change. Sometimes places have been listed as 40 miles from some large city, leaving the reader 360 degrees of direction to choose from.

Local lists often include a "hypothetical" list of species reported from neighboring territories and thus "may be expected at some time in this area." It is amazing how such suggestions often lead to a spate of sight records of the species listed soon after the paper is published. Some state works have listed the subspecies occurring within their borders, describing one form as occupying the northern half while the other form breeds only in the southern half. Amateurs using such lists have apparently taken this too literally and report sight records to subspecies according to which precise half of the state they were in. When trinomials are used in local lists, they should indicate that the author used properly identified specimens. If lack of space was the main reason for omitting a few definite localities, it would be more appropriate to omit subspecies altogether.

Difficulty is also experienced in using some specimen records for plotting subspecific ranges. The troubles most frequently come from the synonymy. The A.O.U. Committee on Classification and Nomenclature examines each newly named race from the North American province and accepts or rejects it for the Check-List by a majority vote. This is not binding on the individual taxonomist. For clarity, the systematist generally states whether or not he is following the rulings and gives his reasons. If this procedure were followed at all times, things would be much simpler. Many papers do not even include the Committee's ruling in the synonymy. The result is that one may find many specimens listed in the literature, which are useless in attempting to work out subspecies ranges for the Check-List. Some taxonomists have named new subspecies, giving general ranges for the new forms and lists of specimens used—unfortunately skins listed as "10 specimens from Alabama" are not very helpful in plotting detailed ranges.

Taxonomists have listed localities but omitted dates. If all specimens are listed as breeding specimens the criteria used in making this determination is not noted. In deciding that a specimen was that of a breeding bird, arbitrary dates are sometimes used which, as pointed out above, may be quite wrong. The size of the gonads is a better criterion, but this is too often left off the labels; nor is it infallible as pathological conditions may affect gonad size.

It may please the sentimentalists that very few birds are collected along with their nests (or this information may be omitted purposely). It would help delimit the breeding ranges of subspecies were this done a bit more often. Some collectors will not shoot a bird while on or near its nest but will collect the same bird some distance away. The nest will be lost in either case either way, so it may as well be saved for science.

At times new subspecies have been named from a particular state by a provincially minded ornithologist who does not examine specimens from neighboring areas, or at least does not mention them in his paper. The new race may, as has happened, split the range of another subspecies into two widely separated parts.

Finally it might be pointed out that sight records and specimen records complement each other in working out the Check-List ranges. The main purpose of this paper has been to point out the more common errors on both sides by showing their harmful effects. For obvious reasons specific references have been omitted.

It would be impossible for the author to thank all who have helped him write this paper. Dr. Alexander Wetmore has been my helpful

guide and overseer in the task of plotting the ranges and has read the manuscript before submission. Dr. A. A. Allen, Dr. O. H. Hewitt, Dr. E. C. Raney, and Dr. W. H. Hamilton, Jr. of the Cornell University Department of Conservation, all have read the paper and made helpful suggestions as have several of the graduate students in the Department of Conservation, Mr. W. C. Dilger, Dr. K. C. Parkes, and Mr. C. R. Robins. Mr. Chandler Robbins of the Fish and Wildlife Service, Section of Distribution of Birds and Mammals, at the Patuxent Research Refuge, Laurel, Maryland, has also read the manuscript.

New York State Museum, Albany 1, N. Y., December 4, 1952.

THE BREEDING BIOLOGY OF HAMMOND'S FLYCATCHER

BY DAVID E. DAVIS

THE small flycatchers of the genus Empidonax have attracted attention for years because of their abundance and the difficulty of identifying them. In particular Hammond's Flycatcher and Wright's Flycatcher have confounded ornithologists. This study was begun with the hope that a more detailed knowledge of the breeding biology of Hammond's Flycatcher (*Empidonax hammondi*) would permit a ready differentiation of the two species. In addition, the comparison of closely related species should produce data with taxonomic and evolutionary implications. Nomenclatural problems also confuse the situation, for Phillips (1939) concludes that Wright's Flycatcher (*E. wrighti* of the 1931 edition of the A.O.U. Check-List) should be called *E. oberholseri*.

It was obvious from the start that the study of Hammond's Flycatcher would not provide data of statistical proportions unless many people studied the bird for many years. Since such effort is not feasible, this report will be largely qualitative and descriptive. The work was done from late June until August in 1950, 1951, and 1952. The observations were obtained primarily on the grounds of the Montana State University Biological Station at Flathead Lake, Montana. Some data were obtained nearby and in Glacier National Park.

Hammond's Flycatchers live in areas of mixed coniferous and deciduous vegetation (plate 12). The frequency distribution of trees in a plot close to the area of observation is given in table 1. Observations in other places suggest, however, that the species of trees are not important so long as the vegetation is fairly dense, is about 40 feet high, and includes both coniferous and broadleaved trees. It should be noted that the flycatchers regularly live near open areas such as roads or lakes.

Other species of birds found in this vegetation are: Russet-backed Thrush (*Hylocichla ustulata*), Ruby-crowned Kinglet (*Regulus calendula*), Western Tanager (*Piranga ludoviciana*), Solitary and Red-eyed vireos (*Vireo solitarius* and *V. olivaceus*), and Ruffed Grouse (*Bonasa umbellus*).

The methods used to obtain the data were very simple. The observer merely sat or stood at a convenient spot and recorded the events, using binoculars when necessary. No blind was used since the birds are not wary. Most of the data were recorded at time intervals and rough maps showing movements were drawn on the spot.

TABLE 1

TREE COMPOSITION IN 15 QUADRATS (50 × 50 FT.) WITH 1152 TREES

Species (Peck, 1941)	*Per cent of Quadrats*	*Per cent of Total Trees*
Grand Fir (*Abies grandis*)	94	45
Douglas Fir (*Pseudotsuga mucronata*)	80	9
Yellow Pine (*Pinus ponderosa*)	13	0.2
Englemann Spruce (*Picea Englemanni*)	20	3
Western Larch (*Larix occidentalis*)	60	3
Paper Birch (*Betula papyrifera*)	73	15
Douglas Maple (*Acer glabrum*)	86	23
Bebb's Willow (*Salix bebbiana*)	7	2

RESULTS

Voice.—The notes will be described first because a knowledge of their functions is essential in understanding the breeding biology.

1. Male Position Note. The male regularly gives a note resembling "che-bec" that is sharp and harsh. The last part is at a lower pitch than the first part. The male gives this note, which is usually called "song," as he moves about his territory. This note is considered to serve to indicate to the female the position of the male. It is believed not to be a territorial defense note for the following reasons: (1) the bird gives it from inconspicuous places; (2) the male uses it within the territory as much as on the boundaries (documentation of this conclusion must be deferred for later presentation); (3) it is not given especially frequently before or after a territorial encounter (few observations); (4) its frequency is as great during the nesting phase as the building phase (table 2); (5) its frequency declines steadily during the day (table 3). The only suggestion that this note may have a function in territorial activities is that it sometimes is given at the time of territorial fights. But an alternative interpretation is that the note may merely indicate the position at this time.

The number of calls given by males was analyzed according to the stage of the nesting cycle. If the calls were territorial their number would be expected to decline rather than to increase while the young are in the nest, especially in view of the lack of second broods. Similarly one would expect that territorial song would be more frequent at morning and evening. Data of this type are not satisfactory, however, because the interpretation given above requires for its confirmation proof that the song, which is supposed to be territorial, in this or a closely related species, declines during the breeding period and increases at the beginning and end of the day. Neither of the

TABLE 2

RELATION OF NUMBER OF POSITION CALLS TO STAGE OF BREEDING CYCLE

Stage	*Minutes Observation*	*Calls per Minute*
Building	659	.396
Eggs in nest	924	.134
Young in nest	543	.448
Young fledged	442	.370

proofs is available for Hammond's Flycatcher or other members of the genus. The data and interpretation are presented in the hope that another person will be in a position to collect the proper data.

2. Female position note. The female gives a mellow "tweep" rather regularly when away from the nest. This note seems to have the same function as the male position note but is given less frequently.

3. Male Alarm Note. A sharp, harsh "chip" or "pip" is used for alarm when hawks, squirrels, or humans come near nest or young. The tail is jerked each time the note is given.

TABLE 3

RELATION OF NUMBER OF CALLS TO TIME OF DAY

Time of Day (MST)	*Minutes Observation*	*Calls per Minute*
5 to 7 a.m.	1440	.49
7 to 9 a.m.	360	.52
9 to 11 a.m.	480	.29
11 a.m. to 1 p.m.	660	.36
1 to 3 p.m.	60	—
3 to 5 p.m.	240	.09
5 to 7 p.m.	480	.03
7 to 9 p.m.	480	.14

4. Female Alarm Note. This note is very similar to that of the male but slightly lower in pitch.

5. Song. On a few occasions a mellow, undulating "twit-twit-twit" has been heard. On several evenings birds have been seen on a tree-top singing a miscellaneous assortment of notes including some male position calls. The bird may fly ten feet into the air and tumble back into the trees. A morning song comparable to that in other species has not been observed, but the weather conditions in the early part of the breeding season make suitable observations impossible.

6. Greeting Note. The female at the nest may chatter or twitter as the male comes near. The greeting is also used when the birds meet away from the nest, probably by both sexes.

Territory.—Unfortunately the territories were established in early June before observations began. During the latter half of June and July the birds remain within a small area and occasionally react toward other birds by brief fights involving some "twit-twit" notes and bill-snapping. Apparently territories are clearly established and little conflict occurs. It is, of course, difficult to observe birds in the dense wood. The position note may be used when these mild fights occur.

Nest.—The nest is built primarily, if not exclusively, by the female in the limited observations available for the latter part of the breeding season. One female constructed a nest alone after her mate had disappeared. She tore apart an old nest at which she and her mate had been seen four days previously but which never had eggs.

The nests are generally placed 25 to 40 feet from the ground (13 nests) although one nest was only 10 feet above ground. Four of fourteen nests were in crotches of the main trunk of small trees and ten were in crotches on horizontal branches about three to five feet from the trunk. Four nests were in birches, one in maple, two in yellow pine, six in western larch, and one in Douglas fir. Note that this distribution is not related to abundance of trees (table 1). These nests are similar to those described in Bent (1942).

The nest is constructed from plant fibers, especially the bark of nine-bark (*Physocarpus capitatus*). A few small twigs or pine needles may occur. The nest is lined with a few feathers and scales from cones of Douglas fir. The inside width is about 6 cm.; the outside width about 9 cm.; the inside depth about 3 cm.; the outside depth about 7 cm. The nest becomes flattened as the young grow large.

The number of eggs averages about three. Four nests had three eggs, one had two, and one had four. In addition three other nests had three young each when first found and two nests had four young.

Incubation is done by the female alone. The male is constantly nearby and may perch in the nest tree. The female comes directly to the nest after an absence and settles down at once. The duration of incubation (15 days from laying last egg) was obtained for only one nest, since most nests had eggs when they were first observed. Incubating birds were observed for 1,159 minutes (19.3 hours). During this time the females left the nest 61 times and were on the nest 77 per cent of the time.

Both adults feed the nestlings. The observations indicated that the male begins to feed the young the day they hatch but the female usually continues to brood and in some cases may not feed the young for several days. At the time of the hatching, the adults are obviously excited. They flit to and fro at the nest, perch on the ledge and peer in, jerk their tails, and give the alarm call. A sexual difference of behavior is evident at feeding. In all cases where the sex could be determined, the female flew directly to the nest and perched on the brim as she does during the incubation period. The male, in contrast, perched on a twig a few inches from the nest before hopping to the brim. In 998 minutes (16.5 hours) of observation at four nests, the male fed the young 17 times and the female fed the young 122 times.

In two cases, the young left 17 days after hatching and in one case, 18 days. All young left within two hours and perched on nearby limbs. The parents continued feeding, and the young continued the calling they had been making while in the nest. The whole family stayed near the nest for several days, and the young slept together on a limb at night. Gradually the young became more active till about 20 days after leaving the nest when they were able to take care of themselves. The family disperses at this time. There is no evidence of a second brood, although renesting occurs.

Some meager data are available for hatching and fledging success. In five nests, with 14 eggs, 5 hatched. In six nests, with 19 young, 16 fledged.

COMPARISON WITH OTHER EMPIDONACES

The breeding biology of some other species of *Empidonax* has been studied. This section will comment on differences or similarities between species that appear in published papers. No extensive search for miscellaneous notes has been made.

The Gray Flycatcher (*E. wrightii*, formerly *E. griseus*) has been observed by Russell and Woodbury (1941) in Utah and Arizona. The similarities to Hammond's Flycatcher are conspicuous. The nest is built by the female, who lays one egg a day until the set is complete and incubates. Both adults feed the young, and the female approaches the nest directly but the male perches on a limb before alighting on the nest. The birds generally remain within a limited area, but territorial defense is rarely seen. The call notes are interpreted in table 4. The two species have different notes and of course live in different types of vegetation.

(*Top*) HABITAT OF HAMMOND'S FLYCATCHER. Note that vegetation consists of conifers and broadleaved species and is fairly tall and dense.

(*Bottom*) HABITAT OF WRIGHT'S FLYCATCHER. Note that conifers and broadleaved species occur but that habitat is on edge of a field.

The Least Flycatcher (*E. minimus*) has been studied by MacQueen (1950) in Michigan. The birds maintain a territory, and the female builds the nest and incubates. Both adults feed the young. MacQueen reports that the nestling period is 14 days in contrast to 17 to 18 days observed in 3 nests of Hammond's Flycatcher in Montana. Both adults drive intruders from the territory but the female is the less active. Limited observations suggest that this behavior occurs in Hammond's Flycatcher also. The notes of the Least Flycatcher are summarized in table 4. The note "che-bec" is easily identified as the male position note. The note "chweep" is identified as the female position note because MacQueen says only the female gives it, whereas both adults give the "whit" which must be the alarm. The nest of the Least Flycatcher as described in Bent (1942: 216) appears to be very similar in construction and size to that of Hammond's allowing for differences in availability of materials in different parts of the country.

The songs of the Alder Flycatcher (*E. traillii*) have been studied by McCabe (1951) in Wisconsin. The male position call is readily recognized, but no female position call is mentioned. He discusses in detail geographic variation in the male position call and also the flight song.

The breeding biology of the Yellow-bellied Flycatcher (*E. flaviventris*) is barely mentioned by Bent (1942), although data on type of nest and voice are available. The nest is placed on or near the ground and is built in 2 layers of mosses and rootlets. The male position note is apparently variable.

The nest of the Acadian Flycatcher (*E. virescens*) is described by various authors in Bent (1942), but little of its breeding biology is mentioned. Limited personal observations at Thomasville, Georgia, in 1951 and 1952 permit a comparison of the call notes (table 4). The birds were found in moist ravines of beech and live oak vegetation. Three nests were found far out on overhanging limbs about 20 feet above the ground.

The nesting of the Western Flycatcher (*E. difficilis*) and Buff-breasted Flycatcher (*E. fulvifrons*) is poorly known. Bent (1942) summarizes some notes on nest type and voice.

Some observations were obtained at 4 nests of Wright's Flycatcher. The notes are readily separated from those of Hammond's Flycatcher (see table 4). The habitat of Wright's Flycatcher (plate 12) differs subtly from that of Hammond's. Wright's requires an edge of mixed conifers and deciduous trees bordering on an open or low bushy area. Three of the nests were located in bushes about 3 feet above the

TABLE 4

COMPARISON OF NOTES OF EMPIDONAX FLYCATCHERS

Species	*Position* — *Male*	*Position* — *Female*	*Alarm* — *Male*	*Alarm* — *Female*	*Flight Song*	*Morning Song*	*References*
Hammond's	che bec	tweep	pip	pip	yes	?	Davis
Least	che bec	chweep	whit	whit	yes	yes	MacQueen (1950)
Alder	fitz creet bew	?	wheet	wheet	yes	yes	McCabe (1951)
Yellow-bellied	pse-ek'	?	chu-e-e'-p	?	yes	?	Bent (1942)
Acadian	pee-whip	whew	whit peet	?	yes	?	Davis
Wright's	clip zee whee	tweep	whit	whit	?	?	Davis
Gray	tu-weet	tseet	?	prit	?	?	Russell and Woodbury (1941)
Gray	pee-ist	?	whit	?	?	?	Bent (1942)

ground, but one nest was in the crotch of a birch about 20 feet above ground. (Both adults were collected at this latter nest.) One nest had 4 eggs of which 3 hatched, another had 4 eggs (4 fledged); another fledged 3 young, and one nest was not yet completed when the adults were collected.

Hammond's and Wright's flycatchers can be easily separated if a good view of the back is obtained. Hammond's has a short tail that is the same color as the back whereas Wright's has a long tail that is brown in contrast to the olive-gray back. Indeed Wright's Flycatcher resembles a miniature Crested Flycatcher (*Myiarchus crinitus*).

SUMMARY

Observations on the breeding biology of Hammond's Flycatcher were made at Flathead Lake, Montana, during three summers. The birds inhabit moderately tall, dense, mixed vegetation. The male and female each have a position note and alarm call. The male has a flight song. The birds maintain a territory. The nest is built about 30 feet from the ground, primarily by the female. The usual clutch consists of three eggs. The female alone incubates, but both adults feed the young.

A comparison with published and personal observations on other members of the genus indicates that there is a considerable similarity of breeding biology but conspicuous differences in habitat. Original data on four nests of Wright's Flycatchers are presented.

LITERATURE CITED

BENT, A. C. 1942. Life histories of North American Flycatchers, Larks, Swallows and their allies. U. S. Natl. Mus. Bull. 179: 1–555.

MACQUEEN, PEGGY M. 1950. Territory and song in the Least Flycatcher. Wilson Bull. 62: 194–205.

MCCABE, ROBERT A. 1951. The song and song-flight of the Alder Flycatcher. Wilson Bull. 63: 89–98.

PECK, M. E. 1941. Higher plants of Oregon. (Binfords and Mort, Portland), 866 pp.

PHILLIPS, ALLAN R. 1939. The type of *Empidonax wrighti* Baird. Auk 56: 311–312.

RUSSELL, HENRY N., and ANGUS M. WOODBURY. 1941. Nesting of the Gray Flycatcher. Auk 58: 28–37.

The Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland, December 24, 1952.

THE TAIL MOLT OF SMALL OWLS

BY ERNST MAYR AND MARGARET MAYR

VERY little is known, so far, about the tail molt in birds. The most frequent mode is that in which the molt starts with the central pair of tail-feathers, to be followed, successively, by one pair after the other, with the outermost pair completing the molt. The opposite to this "centrifugal" type of molt is the "centripetal" molt in which the outermost pair of feathers is molted first and the molt proceeds inward. An "alternating" type occurs occasionally in which alternate pairs of feathers are molted more or less simultaneously, to be followed by a second "wave" of molt affecting the remaining feathers. In the woodpeckers (Picidae) and tree creepers (Certhiidae) the molt is centrifugal, but begins with the second innermost pair of tail-feathers; the central pair of feathers is molted last, which permits the continuous presence of a functional climbing tail. The tree-climbing woodhewers (Dendrocolaptidae), on the other hand, have a regular centrifugal type of molt. These and various types of irregular molts are discussed in detail by Heinroth (1898) and Friedmann (1930). Wetmore (1914) discovered the remarkable fact that in the Malaysian Helmeted Hornbill (*Rhinoplax vigil*) only one of the elongated central feathers is molted at a time. In some Passerine birds, in addition to the Certhiidae, the central pair of tail-feathers is molted last, for instance, in the sunbird *Aethopyga ignicauda* (Mayr, 1941: 480) and in the paradise flycatcher *Terpsiphone* (Ticehurst, 1938: 408).

Little has been known, so far, about the tail molt of owls. Heinroth (1898: 112) says (translation), "The tail molt appears to be rather irregular among the owls, although the centrifugal type appears to be basic." Friedmann did not examine owls. During a study of south Asiatic *Glaucidium*, we discovered that the tail molt is simultaneous in several species. This is true, for instance, for three adults of *Glaucidium radiatum* in the Koelz Collection: adult male, Bihar, 25 August; two adult males, Bichlia, Central Provinces, 10 and 12 July.

A search through the literature revealed nothing of relevance, but Miss E. F. Chawner (Leckford, Stockbridge, England), who has kept many owls in captivity, wrote us as follows (October 3, 1949): "I have noticed that the small European and African species do as a rule moult their tail-feathers simultaneously, so much that I have sometimes seen them in the morning with full tails and by the evening they will have moulted all the tail-feathers. This was particularly

the case with *Athene*. The large species did not shed their tail-feathers in this way, but did it by degrees."

This still left it desirable to examine in what genera the tail molt is complete, and in what others gradual, also whether there are multiple modes of molt in certain genera or species. Dr. W. Meise (Zoological Museum in Berlin) very kindly supplied us with information on molting specimens of *Glaucidium*, *Athene*, and *Ninox*. These comments (by letter, September 27, 1949) are included in the subsequent accounts.

The results of our investigations indicate that the tail molt appears to be gradual in *Tyto*, *Bubo*, and *Strix*. It is simultaneous in individuals of *Otus*, *Glaucidium*, *Athene*, and *Speotyto*. It is simultaneous in the small species of *Ninox* and gradual in the larger ones. No molting specimens of *Aegolius* or *Micrathene* were examined to permit statements on the tail molt of these genera, although it is presumably simultaneous in both genera.

In addition to the specimens in the Berlin Museum examined by Dr. Meise, this investigation is based on the greater part of the material of the American Museum of Natural History, including the Rothschild Collection. In owls, the sequence of the molt of the primaries appears to be from the innermost (first) out. The state of molt of the wing can therefore be precisely described by the number of the wing-feather most recently molted. The tail-feathers are numbered from the inside out, so that the outermost pair is numbered 6 and the innermost pair 1.

The case histories of a number of molting specimens in the genera *Speotyto*, *Athene*, *Glaucidium*, *Otus*, and *Ninox* follow.

Speotyto

1. *Speotyto cunicularia hypugaea*, A.M.N.H. No. 51,728, adult male, Dr. E. A. Mearns coll., Fort Verde, Arizona, August 28, 1886. Seventh primary molted. All tail-feathers are in sheath and equally long.

Athene

2. *Athene noctua ludlowi*, Berlin Museum, No. 471,187, Sikkim, adult male, August 15–25, 1938, E. Schäfer. Sixth primary molted. All tail-feathers in sheath, about 40 per cent of their ultimate length.

3. *Athene noctua sarda*, A.M.N.H. No. 631,192, Sassari, Sardinia, September, 1918. Tail molt nearly completed; all tail-feathers about equally long, with traces of the sheath still adhering.

The beginning of the molt is not always strictly simultaneous, as indicated by a specimen in the Berlin Museum (*fide* W. Meise):

4. *Athene noctua noctua*, No. 39.111, Angermuende (Pommerania), female, November 18, 1897. Seven tail-feathers old (4 left, 3 right). The four central tail-feathers of equal length, in sheath and about 75 per cent grown. One tail-feather missing.

The late date, as well as the fact that the central feathers are nearly full grown while the outer ones give no indication of molting, suggest that the bird is merely replacing the two central pairs of feathers, which it had lost by accident.

5. *Athene noctua bactriana*, Gurgan, Mazanderan, Iran, July 11, 1940, W. Koelz, female. Fifth primary molted. A single old tail-feather present; all others in sheath and very short.

6. *Athene brama*, A.M.N.H. No. 62,882, southern India, no data. Fifth primary molted. All tail-feathers missing.

7. *Athene brama*, A.M.N.H. No. 62,880, southern India, no data. Sixth primary molted. All tail-feathers in sheath, very short.

Glaucidium

Every *Glaucidium* studied by us that showed tail molt apparently molted all tail-feathers simultaneously. Dr. W. Meise wrote us that among 200 *Glaucidium* in the Berlin Museum there are four adults in molt. The details on these four birds are as follows.

8. *Glaucidium brasilianum*, Berlin Zoo, September 16, 1918, female. All six pairs of tail-feathers in sheath. There are slight variations in length among them. The longest is 44 mm.; the two central feathers, 24 and 27 mm. Full tail length about 65 mm. Primaries 6 and 7 in molt.

9. *Glaucidium perlatum*, Berlin Museum, No. 36.1056, Waterberg, South West Africa, W. Hoesch, January 8, 1937, male. Full length of tail normally about 72 mm.; all tail-feathers in sheath, approximately 59 mm., except central pair (37 and 41 mm.). Fifth primary in molt.

10. *Glaucidium cuculoides castanonotum*, Berlin Museum, No. 36,560, Ceylon, 22.8.1894, female. Full length of tail normally about 62 mm.; all tail-feathers in sheath, 51 to 57 mm. long. Primaries 7 and 6 molted.

11. *Glaucidium sjöstedti*, Ahonangi, Cameroon, April 14, 1909, G. Tessmann, female. All tail-feathers in sheath, about three-fourth grown, with slight differences in size, central feather 58, outermost 49 mm. Primaries 7 and 6 molted.

In three specimens of *G. radiatum* and one of *G. cuculoides* in the Koelz Collection, with either the fifth or the sixth primary molting, all the tail-feathers are short and in sheath.

Otus

12. *Otus rufescens rufescens*, A.M.N.H. No. 630,182, Benkoker, North Borneo, September 25, 1885. Eighth primary molted, all tail-feathers in sheath, very short.

13. *Otus brucei*, A.M.N.H. No. 629,983, Baluchistan, June 24, 1898 (Russian calendar). Sixth primary molted. All tail-feathers short and in sheath, except one of the outermost, which is presumably old although it does not appear particularly worn.

14. *Otus scops senegalensis*, A.M.N.H. No. 630,008, Gassam, W. Senegal, September 2, 1907. Sixth primary molted. All tail-feathers absent, except a single worn outer tail-feather.

15. *Otus scops ugandae*, A.M.N.H. No. 630,043, White Nile, Uganda, May 1, 1906, male. Fifth primary in molt. Central pair of tail-feathers just beginning to grow (5 mm.); all lateral tail-feathers old.

16. *Otus leucotis leucotis*, A.M.N.H. No. 630,200, Thies, Senegal, May 10, 1907, female. Sixth primary molted; all tail-feathers in sheath and about equally long.

17. *Otus leucotis granti*, A.M.N.H. No. 630,230, Transvaal, September 25, 1901, female. Fifth primary molted; central pair of tail-feathers just beginning to grow, all other tail-feathers old.

18. *Otus bakkamoena glabripes*, A.M.N.H. No. 629,880, Yunnan, July 9, 1910, male. The entire tail is missing; the sheaths of the new feathers not yet visible.

19. *Otus bakkamoena umbratilis*, A.M.N.H. No. 417,608, Hainan, May 26, 1899, male. The entire tail missing, as in 629,880.

20. *Otus bakkamoena lempiji*, A.M.N.H. No. 387,998, Buitenzorg, Java, February 19, 1949, male. All, except two central pairs of tail-feathers, in molt.

21. *Otus bakkamoena lempiji*, A.M.N.H. No. 629,844, Sumatra, February 26, 1917, female. Tail missing.

Ninox

This genus is particularly interesting because it includes small and large species. It can be shown that the simultaneous tail molt is largely a matter of size.

22. *Ninox superciliaris*, A.M.N.H. No. 411,033, Ambararatabe, Madagascar, April 1, 1931, male. Eighth primary molted. All tail-feathers in sheath, with the central feathers somewhat shorter than the others.

23. *Ninox a. affinis*, A.M.N.H. No. 630,647, South Andamans, December 1897, female. Wing not molting. Lateral tail-feathers somewhat worn, central pair just completing the molt. This is either a case of irregular molt of the central pair of tail-feathers, or else they lagged far behind the others.

24. *Ninox squamipila hypogramma*, A.M.N.H. No. 630,676, Batjan, August 1902. A single central tail-feather in molt. Otherwise no signs of molt.

25. *Ninox squamipila hypogramma*, A.M.N.H. No. 630,678, Batjan, August 1897. No wing molt. All tail-feathers in sheath.

26. *Ninox squamipila hantu*, A.M.N.H. No. 630,683, Mt. Madang, W. Buru, March 18, 1902, male. Ninth primary molted. All tail-feathers in sheath.

27. *Ninox th. theomacha*, A.M.N.H. No. 630,700, Mamberano River, North New Guinea. Eighth primary molted. All tail-feathers lost, all but central pair in short sheaths.

28. *Ninox odiosa*, Berlin Museum, Blanche Bay, New Britain, May 24, 1907. Wing freshly molted. Tail completing its molt, all tail-feathers still in sheath.

29. *Ninox jacquinoti eichhorni*, A.M.N.H. No. 630,783, Choiseul, Solomon Islands, December 11, 1903, female. Fourth primary molted; all tail-feathers short and in sheath.

30. *Ninox jacquinoti jacquinoti*, A.M.N.H. No. 630,764, Ysabel, Solomon Islands, June 20, 1901, female. Second primary molted; all tail-feathers short and in sheath.

31. *Ninox jacquinoti jacquinoti*, A.M.N.H. No. 630,763, Ysabel, Solomon Islands, June 29, 1901, female. Eighth primary molted. Tail molt virtually completed, sheath still adhering to base of central pair of tail-feathers.

32. *Ninox jacquinoti jacquinoti*, A.M.N.H. No. 219,158, Ysabel, Solomon Islands, August 24, 1927, male. Fourth primary molted. All tail-feathers, except central pair, in sheath.

33. *Ninox jacquinoti granti*, A.M.N.H. No. 630,791, Guadalcanal, May 18, 1901, male. Sixth primary molted. Tail molt nearly complete, central tail-feathers a little shorter than others and still in sheath.

34. *Ninox theomacha rosselliana*, A.M.N.H. No. 630,719, Sudest Island, Louisiade Archipelago, March 21, 1898, male. Eighth primary molted; all tail-feathers in sheath and equally long, except central pair which is not yet molting.

35. *Ninox theomacha rosselliana*, A.M.N.H. No. 630,722, Sudest Island, April 16, 1898, female. Wing not in molt. Outermost tail-feather new, next to outermost in molt, four central pairs of tail-feathers old.

36. *Ninox theomacha rosselliana*, A.M.N.H. No. 630,720, Sudest Island, March 24, 1898; female. Wing molt completed. Tail-feathers 6 (outermost), 5 and 4 new, 3 and 2 molting, 1 (innermost) old.

37. *Ninox theomacha rosselliana*, A.M.N.H. No. 630,721, Sudest Island, April 6, female. Ninth primary molted; tail as in 630,720.

38. *Ninox punctulata*, A.M.N.H. No. 630,730, Makassar, Celebes, September 1895, male. Fifth primary molted; all tail-feathers, except one central one, in sheath.

39. *Ninox meeki*, A.M.N.H. No. 630,738, Manus, Admiralty Is., September 1913, female. Fifth primary molting; two central pairs in short sheath, all outer ones full grown, without sheath.

40. *Ninox meeki*, A.M.N.H. No. 630,740, data as 630,738, male. No wing molt; typical centripetal tail molt; 6, 5 completed, 4, 3, 2 progressively shorter, 1 (central pair) not yet molted.

41. *Ninox rufa humeralis*, A.M.N.H. No. 630,268, Milne Bay, New Guinea, February 1899, female. Strictly centripetal tail molt. Outermost tail-feather (6) fresh, 5–3 almost full grown with base still in sheath, 2 short, 1 (central pair) very short.

42. *Ninox rufa rufa*, A.M.N.H. No. 630,258, Northern Territory, Australia, November 1909, female. Five outer pairs of tail-feathers fresh, no longer in sheath; central pair, one feather old, the other short and in sheath.

43. *Ninox connivens rufostrigata*, A.M.N.H. No. 630,356, Morotai, no date. Three outer pairs virtually full grown, but base still in sheath; three central pairs very short and in sheath.

44. *Ninox connivens assimilis*, A.M.N.H. No. 630,349, New Guinea, December 1913, male. Four outer pairs freshly molted, two central pairs nearly full grown, but still in sheath.

45. *Ninox connivens assimilis*, A.M.N.H. No. 630,354, New Guinea, December 1913, male. All tail-feathers in sheath; 6, 5, 2, 1 three-quarters grown, 4, 3 full grown.

46. *Ninox connivens peninsularis*, A.M.N.H. No. 630,305, Dawson River, Queensland, January 31, 1909, female. Strictly centripetal tail molt; all feathers in sheath, 6 full grown, 5–1 progressively shorter.

SIZE, CLASSIFICATION, AND MODE OF TAIL MOLT

There is an obvious correlation between body size and tail molt. It tends to be simultaneous in all small species. For instance, in *Glaucidium* (wing 90–165 mm.), the tail molt is virtually always simultaneous, although the central pair of tail-feathers sometimes has a tendency to be shed later. Since the tail molt in *Glaucidium* is so uniform, no effort was made to record all specimens showing tail molt in our collections.

In the genus *Athene* (wing 145–170 mm.), the tail molt likewise always seems to be simultaneous. It is true for the only molting specimen of *Speotyto* (wing 165–180 mm.) examined.

In the genus *Otus* (wing 115–195 mm.) a simultaneous tail molt also prevails. However, in several specimens (13, 14, 15, 17) the molt appears to begin with the central tail-feathers, although in one specimen (20) this pair seems to be lagging behind.

The genus *Ninox* is of particular interest because it spans a wide range of size (table 1). The various species with a wing length of less than 210 millimeters have essentially a simultaneous tail molt, although the central pair or two central pairs may lag behind the others. Those with a wing length of 210–230 mm. may have either centripetal, irregular, or simultaneous tail molt, whereas forms with a wing length of more than 230 mm. usually have a centripetal tail molt, although it may be somewhat irregular.

TABLE 1

APPROXIMATE WING-LENGTH IN SPECIES OF *Ninox* STUDIED

Name	*Wing Length*	*Type of Molt**
Ninox punctulata	157–170	simultaneous (slightly irregular)
odiosa	160–180	simultaneous
affinis	170–180	irregular
jacquinoti granti	175–185	simultaneous (slightly irregular)
theomacha theomacha	180–185	simultaneous (slightly irregular)
superciliaris	180–195	simultaneous (slightly irregular)
jacquinoti eichhorni	186–201	simultaneous
jacquinoti jacquinoti	195–208	simultaneous, simultaneous, simultaneous (slightly irregular)
squamipila hantu	190–210	simultaneous
theomacha rosselliana	210–220	simultaneous (slightly irregular), centripetal, centripetal, centripetal
squamipila hypogramma	220–225	irregular, simultaneous
meeki	220–230	centripetal, centripetal (irregular)
connivens assimilis	255–270	? centripetal, irregular
connivens peninsularis	270–285	centripetal
connivens rufostrigata	275–295	centripetal (irregular)
rufa humeralis	310–330	centripetal

* Statements separated by a comma refer to different specimens of the same species.

THE SIGNIFICANCE OF SIMULTANEOUS TAIL MOLT

Deviations from a "normal" molt pattern can often be shown to be adaptive, such as the tail molt in woodpeckers, or the simultaneous wing and tail molt in water and marsh birds. But what possible selective significance could a simultaneous tail molt have? No answer to this question can yet be given. The simultaneous loss of all tail-feathers unquestionably reduces the maneuverability of the individual. Normally there will thus be selection pressure for a gradual tail molt. However, a gradual tail molt, involving successively one feather after the other, is presumably based on a more complex physiological mechanism than a simultaneous tail molt. There will thus be a rather intense mutation pressure against it, and

this complex mechanism can stay perfect only if maintained by selection. If such selection should relax, a simultaneous tail molt might take its place.

It is thus possible that the simultaneous tail molt in small owls is due to relaxation of selection. The small species may require the tail less in flight than the large ones, also they may feed during the summer on smaller prey (insects) which requires less leverage by the tail. The fact that birds in tail molt nearly always molt the same two or three neighboring primaries indicates that the tail molt of a given individual proceeds with relative rapidity. It is therefore also possible that complete taillessness during a short period is biologically less disadvantageous than is a tail in partial molt for several months.

SUMMARY

The tail molt in owls may be simultaneous, centripetal, or irregular.

In the smaller species (wing less than 210 mm.) it is usually simultaneous, in the larger species (wing more than 230 mm.) it is usually centripetal.

LITERATURE CITED

FRIEDMANN, H. 1930. The caudal molt of certain coraciiform, coliiform and piciform birds. Proc. U. S. Natl. Mus., 77, art. 7: 1–6.

HEINROTH, O. 1898. Schwingen- und Schwanzmauser der Vögel. Sitzungsber. Ges. naturf. Freunde, Berlin: 96–118.

MAYR, E., *in* STANFORD, J. K., AND E. MAYR. 1941. The Vernay-Cutting Expedition to Northern Burma.—Part V. Ibis, 1941: 479–518.

TICEHURST, C. B., *in* STANFORD, J. K., AND C. B. TICEHURST. 1938. On the Birds of Northern Burma.—Part III. Ibis, 1938: 391–428.

WETMORE, A. 1914. A peculiarity in the growth of the tail-feathers of the Giant Hornbill (*Rhinoplax vigil*). Proc. U. S. Natl. Mus., 47: 497–500.

Museum of Camparative Zoology, Harvard University, Cambridge 38, Massachusetts, May 7, 1953.

VARIATION IN A FLOCK OF THE EUROPEAN STARLING

BY LEROY C. STEGEMAN

THE European Starling (*Sturnus vulgaris*) has become so numerous in the region of Syracuse, New York, that there are several flocks, numbering into the thousands, roosting in or on various towers or buildings during the winter. One such flock roosted in a tower of one of the buildings at Syracuse University and was the source of the 455 specimens (240 males and 215 females) utilized in this study.

A study of the literature relative to weights, measurements, and variations in birds reveals the fact that many studies have been made on only a few specimens, and oftentimes these were collected at widely different places over a considerable length of time and frequently by different individuals. Each of these factors lessens the accuracy of the information collected.

In this study all of the specimens were collected at the same time, at the same place, and in the same manner and given the same treatment by the same person. All weights and measurements were taken in the same way by means of the same instruments. Therefore, the resulting figures are as nearly comparable as possible.

This study was conducted to determine the normal variation in a flock at one time, the sex ratio in a late winter flock, sexual differences in size and weight, and the variation in the weights of the internal organs.

The specimens were collected on March 28, at night after the flock had quieted down. The birds were caught by hand or in insect nets after screens had been placed over the exits from the tower in which they were roosting. As they were captured, they were placed in large burlap bags. The birds in the bags were then lowered into galvanized trash cans and chloroformed.

When the collecting was completed, the birds were spread in a cold room to remove the body heat. The following morning the birds were weighed in groups of 50 and then stored in a cold room (from 32° to 35° F.) for further study. As removed from the cold room, each group was again weighed to determine the percentage of weight lost through dehydration. This factor was then used in computing individual weights. The amount of weight lost in this way decreased daily, beginning with a high of four-tenths of one per cent during the first 24 hours.

Six external measurements were taken on each fresh specimen as follows:

Total length (tip of bill to tip of tail feathers) was measured after the bird had been relaxed by repeated flexing. The bird was then suspended against the measuring board so that the weight of the bird acted as a stretching force.

Tail length was measured by raising the tail to approximately a 90-degree angle with the back and measuring from that angle to the tip of the longest tail feather.

Wing length was measured from the distal joint of the wing (the wrist) to the tip of the longest primary. The measurement was taken while that part of the wing was pressed against the measuring board.

Head length was taken as the maximum length from tip of bill to back of skull.

Cranial width was measured as greatest width of the skull.

Bill length was taken by measuring from tip of bill to corner of mouth.

Total length, tail length, and wing length were measured on a board accurate to one millimeter. Head length, bill length, and cranial width were taken with calipers calibrated to one-tenth of a millimeter. Weights of the birds were taken on a scale calibrated to one-tenth of a gram, and the internal organs were weighed on a balance calibrated to one ten-thousandth of a gram.

As soon as the external measurements were taken, the body cavity of each bird was opened in order to examine the gonads. This served to determine the sex and to reveal the size of the gonads. The largest and smallest gonads were weighed while fresh, and all others were left in place for preservation. The birds were then stored in five per cent formaldehyde in preparation for further study.

After hardening in this preservative for several months, the internal organs were carefully removed and weighed. The weight in each case was therefore the preserved weight. This made for greater accuracy since the tissues were then hardened and there was no bleeding or loss of tissue fluids during the operation. Each part was rolled over blotting paper to remove excess moisture before being weighed.

Birds captured in winter present a minimum of variation. Young birds have attained adult size in most respects, and most adults do not yet show variations associated with the breeding season.

Table 1 gives the arithmetic mean, the standard deviation, and the standard error of the mean for these measurements. In a normal distribution, the standard deviation is greater than the mean deviation in the proportion of 1.0000 to 0.7979. It is used in this study because it gives greater emphasis to the extremes than does the mean deviation.

TABLE 1

SIZE VARIATION SHOWN BY 240 MALE AND 215 FEMALE STARLINGS
LENGTHS IN MILLIMETERS. WEIGHTS IN GRAMS

Item		*Maximum*	*Minimum*	*Mean ± Standard Error*	*Standard Deviation*	*Standard Dev. × 6*	*Range*
Total length	♂	238	215	228.6 ± 0.30	4.53	27	23
	♀	237	211	224.9 ± 0.31	4.41	26	26
Tail	♂	80	64	73.5 ± 0.53	8.13	49	16
	♀	78	64	72.1 ± 0.62	8.89	53	14
Wing	♂	137	122	129.2 ± 0.14	2.08	12	15
	♀	137	120	126.5 ± 0.18	2.62	16	17
Head	♂	61	53	56.5 ± 0.10	1.62	10	8
	♀	59.5	53	55.2 ± 0.09	1.32	8	6.5
Cranial width	♂	21.5	20	20.9 ± 0.03	0.41	2	1.5
	♀	21.0	19.5	20.2 ± 0.03	0.38	2	1.5
Bill	♂	40.0	31.5	35.7 ± 0.12	1.70	10	8.5
	♀	39.0	31.0	34.8 ± 0.10	1.52	9	8
Weight	♂	98.0	66.5	82.0 ± 0.36	5.22	31	32
	♀	89.5	60.0	76.2 ± 0.39	5.66	34	29.5
Brain	♂	2.20	1.65	1.897 ± 0.010	0.111	0.664	0.55
	♀	1.95	1.55	1.754 ± 0.011	0.121	0.728	0.40
Gizzard	♂	3.00	1.45	2.292 ± 0.012	0.134	0.803	1.55
	♀	3.05	1.55	2.264 ± 0.009	0.099	0.591	1.50
Heart	♂	1.90	1.10	1.494 ± 0.002	0.022	0.131	0.80
	♀	1.85	1.10	1.399 ± 0.003	0.028	0.168	0.75
Liver	♂	5.55	3.20	4.110 ± 0.044	0.498	2.985	2.35
	♀	5.00	2.95	3.823 ± 0.043	0.460	2.759	2.05
Lungs	♂	2.10	1.20	1.726 ± 0.016	0.183	1.096	0.90
	♀	1.95	1.10	1.585 ± 0.018	0.188	1.087	0.85
Gonads	♂	1.30	0.02	0.222 ± 0.007	0.076	0.453	1.28
	♀	0.14	0.002	0.048 ± 0.005	0.047	0.282	0.138

The mean plus or minus one standard deviation includes 68.28 per cent of the area under the distribution curve; two standard deviations on each side of the mean include 95.46 per cent; and three standard deviations on each side include 99.73 per cent of the area. For the number of observations made, the standard deviation is close to one sixth of the normally expected range. Standard deviation times 6 (S. D. × 6) and range are therefore included in the tables to show how the data in this study conform to the normal distribution.

Standard error of the mean is included to show whether or not the differences in measurements between the males and females are

statistically significant. The standard error is greater than the probable error in the proportion of 1.0000 to 0.6475. If the difference between two means is greater than three standard errors, the difference is highly significant.

External Measurements (*table 1*).—The average total length of the males was 3.7 mm. greater than that of the females; however, there was a 78 per cent overlap in this measurement. All birds less than 215 mm. in total length were females and all birds over 237 mm. were males. Such narrow limits are useless in determining sex from measurements of total length. The difference in the means for males and females (3.7 mm.), however, is over eight times the standard error for the difference, and therefore is significant and cannot be accounted for by chance.

The minimum tail length was the same in both sexes, but the maximum length for males was 2 mm. greater, and the mean, 1.4 mm. greater for the males. This difference, however, is less than twice the standard error of the difference and therefore not statistically significant. It is too small a difference to be helpful in distinguishing the sexes. The high standard deviation for these measurements probably does not reflect unusually great variation in tail length. Had the tails been measured in the usual way (cf. Ridgway, U. S. Natl. Mus. Bull. 50, pt. 1: xv, 1901), not only would greater precision have been obtained, but the standard deviation would have been less and a significant sexual difference in tail length might have been found.

The wings of the males average 2.7 mm. longer than those of the females, and since this difference is over 11 times the standard error of the difference, it is significant. The table shows that an occasional female may have as long a wing as the male and therefore sexes cannot be determined on this basis.

Head length is an actual skeletal measurement and not dependent upon feathers. The measurements were taken with the skin on.

Both males and females have a minimum head length of 53 mm. Only one male had this short a head, however, and it was evidently an immature specimen, judging from the small size of the gonads. Six females had heads of this length. All individuals with heads over 59.5 mm. long were males. There were 17 in this group. Head length in the male averaged 1.3 mm. larger than that of the female. This difference is about seven times the standard error of the difference and therefore is statistically significant.

Cranial width is also a skeletal measurement and, although small, bears out the larger size of the males. The difference between the

means for the two sexes is 0.7 mm., which is over 18 times the standard error of the difference for these measurements.

Bill length for the males averaged 35.7 ± 0.12 mm. and for the females 34.8 ± 0.10 mm. The difference of 0.9 mm. between these two is therefore over five times the standard error of the difference and is significant.

Weight is probably the most variable measurement taken since it varies with the physiological condition of the animal. Of course disease or injury might produce abnormal individuals, although none were noticeably affected in this study. February is a time when weight should be fairly constant since juveniles are well developed and the gonads, particularly of the females, are still small. (There were a few exceptions to this among the males.) It is known that the gonads of juveniles are usually somewhat smaller than those of adults at this time. They are also slower to enlarge in the spring. The average weight of the males was 82.0 grams, which is 5.8 grams more than the average for the females. This difference is over 10 times the standard error of the difference and therefore significant. During the breeding season when the gonads of both sexes are greatly enlarged, the average weight would be greater. Since the ovary is relatively huge while eggs are being matured, the females might average as heavy, or even heavier, than the males during that period.

Internal Measurements (table 1).—Brain weights were larger in the males—the average being 1.897 ± 0.010. The average for the females was 1.754 ± 0.011, thus the difference between the means is 0.143 gram, which is over nine times the standard error of the difference and therefore statistically significant.

The weight of the empty gizzard is more variable; the distribution curve would be more flat in both sexes than that of the brain, but the standard deviation is about the same. The average weight in the male is 2.292 ± 0.012 and in the female is 2.264 ± 0.009. Thus the difference between the means (0.028) is less than two standard errors of the difference and therefore not significant.

The standard deviation of the weight of the heart is 0.028 in the males and 0.028 in the females. The males have the larger hearts, the average weight being 1.494 ± 0.002 grams. This is 0.095 gram heavier than the average weight of 1.399 ± 0.003 grams for the females. This difference of 0.095 is over 28 times the standard error of the difference.

The liver, like the gizzard, shows a relatively flat distribution curve. The standard deviation is higher for this organ than for any other organ measured, being 0.498 for males and 0.460 for females. The

males have the heavier livers—their average being 4.110 ± 0.044 grams, which is 0.287 grams heavier than the average weight of 3.823 ± 0.043 grams in the females. This difference is over four times the standard error of the difference and therefore has statistical significance. The males have the heavier lungs—the average being 1.726 ± 0.016 grams. This is 0.141 gram heavier than the average of 1.585 ± 0.018 for the females. This difference is significant since it is nearly six times the standard error of the difference.

TABLE 2

THE WEIGHT IN GRAMS AND PER CENT OF BODY WEIGHT OF THE PRINCIPAL INTERNAL ORGANS

		Brain		*Gizzard*		*Heart*	
Sex	*Total Weight*	*Weight*	*Per Cent*	*Weight*	*Per Cent*	*Weight*	*Per Cent*
Males	82.0	1.90	2.31	2.29	2.79	1.49	1.82
Females	76.2	1.75	2.30	2.26	2.97	1.40	1.83

		Liver		*Lungs*		*Gonads*	
Sex	*Total Weight*	*Weight*	*Per Cent*	*Weight*	*Per Cent*	*Weight*	*Per Cent*
Males	82.0	4.11	5.01	1.73	2.10	0.22	0.27
Females	76.2	3.82	5.02	1.58	2.08	0.05	0.06

The gonads are subject to great seasonal variation, and since the sexes differ so greatly no direct comparison of size or weight between the sexes seems desirable. The distribution curve for the male is not a normal curve apparently because recrudescence had begun in the gonads of a few individuals. This is shown in table 1 by the fact that the range is 1.28 whereas the normal or expected range should be about six times the standard deviation or 0.453. However, after removing the 13 individuals (5.4 per cent) with the largest gonads, the remainder show fairly normal distribution. This is in agreement with the findings of Kessel (Bird Banding, 22: 16–23, 1951), and according to her study they probably represent adult males rather than first-year males. Miss Kessel's study was not published in time to make use of the age indicators in studying these specimens.

The average weight of gonads for all males was 0.222 ± 0.007 grams. The smallest weighed 0.02 gram and the largest, 1.30 grams.

The weight distribution curve for the ovary is much more normal as shown by the range. Three individuals, or 1.4 per cent, had ovaries that were considerably larger than those of the others and probably represent adult females (Kessel) in which recrudescence of

the gonads had begun. The average weight of the ovaries was 0.048 ± 0.005 gram.

The above statistical treatment of the data collected shows that male starlings are significantly larger than the females not only in external measurements, but also in the size of each of the principal internal organs with the exception of the gizzard. This means that the digestive system, at least the gizzard, may be relatively larger in female than in male starlings. Table 2 shows the relative size relations for each organ and for each sex.

The per cent of the total weight made up by each organ reveals that the following organs are alike for the two sexes to two one-hundredths of one per cent: brain, heart, lungs, and liver. This is too small a difference to have any significance. Aside from the gonads, the only organ which appears to be proportionately larger in one sex than the other is the gizzard, which is relatively larger in the female than in the male.

SUMMARY

The variation shown by 455 birds from a single flock of Starlings taken in March follows a normal curve very well and has a spread of approximately six standard deviations.

The sex ratio was 52.7 males to 47.3 females.

Males are significantly larger than females in all external measurements. The overlap, however, is 78 per cent, and therefore the difference can not be used to determine the sexes in the field.

Sexual variation in the size of internal organs compares very closely with that in the external measurements, the male being significantly larger. The per cent of the total weight made up by each organ is alike for the two sexes to one-hundredth of one per cent for the brain, heart, and liver, to two one-hundredths of one per cent for the lungs. The gizzard is eighteen one-hundredths of one per cent more of the weight of the female than of the male. Therefore, even in the organ (gizzard) showing greatest diversity, the per cent of total weight varies less than two-tenths of one per cent between the sexes.

The testes varied in weight from 0.02 gram to 1.30 grams. Thus, the largest was 65 times larger than the smallest.

The ovaries varied from 0.002 gram to 0.140 gram. Thus, the largest was 70 times as heavy as the smallest.

State University of New York, College of Forestry, Syracuse, N. Y., September 11, 1952.

REPORT OF THE AMERICAN ORNITHOLOGISTS' UNION ADVISORY COMMITTEE ON BIRD PROTECTION

This report can only attempt to review the highlights of conservation events during the past year or more, report on the present status of certain rare species for which special efforts are necessary, and describe current threats which now appear to endanger some of the conservation gains of past years.

The waterfowl regulations in the United States were generally liberalized by permitting additional days of shooting in some flyways, by increasing bag limits in several cases, and by permitting shooting until sundown in all flyways instead of an hour before that time. An "experimental open season" on Wilson Snipe and a change in the Woodcock season from 30 to 40 days were announced without much data to support these changes. In addition, portions of five refuges were opened to public shooting for the first time this year. These changes were made despite the fact that the combined data from all sources indicate a decrease of ducks in all flyways except the Atlantic, where an increase in diving ducks was indicated.

This represents a departure from previous policies of basing the hunting permitted on the current trends in waterfowl populations. The sole justification presented was that these changes, especially the later closure of the shooting day, would help reduce crop damage in certain areas. The logic of nation-wide liberalization of hunting privileges for the purpose of handling local problems is open to question.

The Canadian regulations governing the issuance of crop protection permits have been revised, and such permits previously issued in Ottawa will now be issued by local game officers or by provincial authorities. Such a procedure will unquestionably permit more rapid handling of real crop damage problems but can also be abused unless local officials are exceedingly careful to limit permits to cases of actual damage. Several unfortunate experiences in the United States, such as the Band-tailed Pigeon episode in California several years ago, emphasize the danger inherent in such a program.

On the brighter side, several important new sanctuaries have been added to the refuge system.

The Richardson Lake Bird Sanctuary, established January 30, 1953, in the Athabasca Delta region of Alberta, provides added protection for Ross's Goose which stops in this area in numbers in both fall and spring migration.

The Interior Department appropriation for 1954 gives the Fish and Wildlife Service authority to lease and manage lands within the

natural habitat of the Key Deer. Under this authorization the Service will be able to take over the cost of patrol and fire prevention, borne the first year by the Boone and Crockett Club and other organizations, and during the past year by the National Wildlife Federation. Unsuccessful efforts were made during the last two sessions of Congress to secure passage of a bill which would give the Fish and Wildlife Service authority to protect these animals and grant funds for purchasing a refuge. The present authorization, while far from ideal, can provide continued protection for this smallest representative of the white-tailed deer. During the past two years, there was practically no loss of Key Deer except from speeding automobiles. Actually, during this interval, the population increased from about 30 animals to more than 70.

The Key Deer range on the few islands east of Key West is used for nesting and feeding by Great White, Würdemann's, and Ward's herons and as a nesting ground by White-crowned Pigeons. It is also used by many other species of wading birds, shorebirds, gulls, and terns for nesting and feeding. Alligators and Florida Crocodiles are found in the range area as well as wild orchids, tree snails, and tropical plants and trees, which add general interest to the area.

Establishment of the 141,000-acre Loxahatchee National Wildlife Refuge in eastern Florida will provide an area of outstanding importance for water birds. This refuge is being developed on a multiple-use project southeast of Lake Okeechobee under a joint agreement with the Central and Southern Florida Flood Control District and the Department of the Army. In addition to waterfowl, it is expected to benefit herons, ibises, limpkins, and the Everglade Kite.

A first unit, comprising 2,247 acres, has been acquired in the Monte Vista National Wildlife Refuge in Rio Grande County, Colorado, and the Migratory Bird Conservation Commission has approved purchase of an additional 2,133 acres on which options have been obtained. This is the first successful effort to secure a national wildlife refuge in Colorado, where large concentrations of ducks, particularly mallards, have created crop-damage problems. It represents an approach to waterfowl management problems which merits support from all conservationists.

The Shiawassee National Wildlife Refuge in Saginaw County, Michigan, was authorized by the Migratory Bird Conservation Commission when the purchase of a unit of 2,246 acres of land was approved. This refuge will adjoin an area which the State of Michigan is purchasing for management as a public shooting ground.

The fact that the Hawaiian Islands National Wildlife Refuge, established in 1909 and extending for 1,500 nautical miles northwest from Honolulu, seems assured of closer supervision is worth mentioning. An agreement between the Board of Commissioners of Agriculture and Forestry and the U. S. Fish and Wildlife Service, approved on December 28, 1951, provides for the joint administration and supervision of this island group. The Board will undertake the posting of these islands, using the Fish and Wildlife Service boundary markers. Permits for entry will be issued by the Board, while permits for the taking of specimens for scientific purposes will continue to be issued by the Service. Conservation officers, as designated by the Board, have been made deputy game management agents. Included in this refuge are a number of famous bird-nesting rocks and islands, particularly Laysan Island on which the Laysan Teal (*Anas laysanensis*) and Laysan Finch (*Psittirostra cantans*), continue to survive, although the Flightless Rail (*Porzanula palmeri*), the Miller Bird (*Acrocephalus familiaris*), and Honey Creeper (*Himatione sanguinea freethii*) have become extinct. These islands also include the largest nesting colonies of albatross in the Northern Hemisphere.

The reports on several species of rare birds in which there is widespread interest are both good and discouraging:

In the opinion of the National Audubon Society, the Ivory-billed Woodpecker may now be extinct. It has been many years since it has had any reliable reports of birds in or near the Singer tract. The birds have not been seen on the Florida sanctuary for these birds since it was established. It was made a sanctuary after two birds were observed there on March 3, 1950, by Whitney H. Eastman. The Society believes that there may still be a few birds in certain areas in Florida but has received no reliable reports of such birds in the past two years.

The status of the Whooping Crane has also become increasingly precarious. Three 1951–52 surveys by the Fish and Wildlife Service showed only 21 birds, including, however, five young. In addition, two crippled birds are being cared for in the Audubon Park Zoo in New Orleans. When the Aransas Refuge, on which the birds winter, was established in 1937, only 14 Whooping Cranes were known. This number increased to 34 in 1950. The present status of the birds cannot be determined until they again arrive on their wintering grounds.

The California Condor seems to be holding its own, and there may have been a slight increase in the number, estimated by Koford at about 60, of which about one-third are immature.

Considerable concern has been aroused by a permit issued to the San Diego Zoo to trap two adults, a project which has not been carried out so far as is known. The opposition to this proposed action brought about legislation, which became law in June, forbidding the issuing of any further permits to take condors and terminating the existing permit on January 15, 1954. This legislation will, unless the efforts to trap birds is successful before January 15, remove a threat to the small condor population which ornithologists best acquainted with this species consider a serious one.

The 1953 fall count of Trumpeter Swans revealed a total of 577 in the United States, the highest number found in the 19 years of annual censuses. This figure includes those of the Red Rock Lake Refuge, which has the greatest population, the birds in Yellowstone Park, and the smaller numbers on the National Elk Refuge in Jackson Hole, Malheur Lake Refuge in Oregon, and Ruby Lakes Refuge in Nevada. The census showed 478 adults and 99 cygnets. The latter was six more than in the 1952 census, while the number of adults remained the same.

Serious threats exist to established national wildlife refuges, national parks, and national forests which provide the solid framework on which wildlife conservation programs have been built. Perhaps the most dangerous legislative proposal is H. R. 4646 which is on the House Calendar. It would, as reported out by the Committee, permit certain timber landowners to go into any national park, national monument, wildlife refuge, or national forest and select land to replace any of their own lands taken by Federal construction agencies for reservoir purposes. The bill is loosely drawn and practically compels the administering agency to give the timber owners what they want. Any national park, refuge, or forest could be legally gutted under this proposal. The bill is backed by the National Lumber Manufacturers' Association and the U. S. Chamber of Commerce, and opposed by practically all conservation organizations.

There is a concerted effort under way to break up the national forests and turn much of the land over to private interests on one pretext or another.

In addition to such sweeping proposals, there are specific attacks on many areas. Bills to authorize Glacier View Dam and the dams in the Dinosaur National Monument have been introduced. Continual efforts are being made to eliminate the rain forest areas from the Olympic National Park, efforts to get oil concessions on the Souris Refuges in North Dakota and the Okefenokee Refuge in Georgia have been renewed, more or less advanced schemes are being promoted

to take lands of at least three Atlantic Coast Wildlife refuges for development as public beaches, and numerous other schemes to invade parks and refuges which have previously been turned down are being brought to life.

Of a somewhat different type was an effort to open to shooting the Sacramento National Wildlife Refuge in California. This brought the welfare of the Ross's Goose (*Chen rossi*) into sharp focus. After careful review of the matter, Director John Farley of the U. S. Fish and Wildlife Service decided that no change would be made in the status of the Sacramento National Wildlife Refuge at the present time. A study of the numbers, movements, and habits of the Ross's Geese on their wintering grounds will be made. Particular attention will be given to the relationship of the refuge and its future development to the present and future welfare of the geese.

All in all, conservationists do not need to look for any small issues on which to do battle; the prospects are that there will be plenty of critical battles ahead. It will take concerted effort to protect the ground that has been gained in the past, to say nothing of developing and carrying out constructive programs to meet new problems and new needs.

IRA N. GABRIELSON, *Chairman*
LUDLOW GRISCOM
HOYES LLOYD

UNPUBLISHED THESES IN ORNITHOLOGY

Beginning in 1949 the Committee on Research undertook the compilation of a list of unpublished theses in ornithology. The objective was to make known to other investigators data which would probably not be published, but which might prove valuable in relation to other studies or in the formulation of new projects.

Letters were sent to approximately 50 American and Canadian universities and colleges in the fall of 1949 requesting a list of their unpublished theses in ornithology. About 30 replies were received over a period of two years. The first draft of the list was begun in the summer of 1951. In the spring of 1952, this draft was sent to all of the universities and colleges which responded for checking and for additions. Notices were also sent to 11 more Canadian universities which were not included in the original survey. Upon the completion of this step, the final list was compiled in the summer of 1952.

An effort has been made to omit from this list any thesis which has been published in part. Such theses would be known, or at least have been cited in the published literature. The Committee wishes to remind the users of theses that they should be cited along with the published literature. It is also necessary in some cases to secure the permission of the author before data can be cited. The libraries of the universities concerned should be approached for the loan of a thesis and the regulations concerning its use.

Two other lists of theses are available which include many in ornithology. These are based on titles in the field of ecology and management of wildlife, written between 1934 and 1949 (*Wildlife Review* No. 50, February 1950) and through 1950 (*Wildlife Review*, No. 63, March, 1951). They include published as well as unpublished theses, are classified according to subjects, and contain also an alphabetical list of authors and a list of the colleges and universities represented by the theses.

Unpublished Theses in Ornithology

Allison, Donald G. 1947. Bird populations of forest and forest edge in central Illinois. M.S., University of Illinois.

Allison, John E. 1947. Gonadal response in the male English Sparrow, *Passer domesticus* (Linnaeus), following the administration of pregnant mare serum. M.A., University of Minnesota.

Ammann, George A. 1938. The life history and distribution of the Yellow-headed Blackbird. Ph.D., University of Michigan.

Arnold, John R. 1938. The systematic position and natural history of the Northern Blue Jay, *Cyanocitta cristata bromia* Oberholser. Ph.D., Cornell University.

BENSON, DIRCK. 1937. Studies in the ecology of the Black Duck, *Anas rubripes* Brewster. M.A., Cornell University.

BENSON, MARY H. 1939. A study of the American Redstart (*Setophaga ruticilla* Swainson). M.S., Cornell University.

BIBBEE, PAUL C. 1947. The Bewick's Wren, *Thryomanes bewickii* (Audubon). Ph.D., Cornell University.

BLACK, CHARLES T. 1941. Ecological and economic relations of the Crow, with special reference to Illinois. Ph.D., University of Illinois.

BLOUCH, RALPH I. 1942. The Bob-white (*Colinus virginianus*) in Franklin County, Pennsylvania. M.S., Pennsylvania State College.

BOUGHTON, DONALD C. 1928. Studies on the Isospora of Minnesota. M.S., University of Minnesota.

BOWERS, GLENN L. 1948. A population study of the Ruffed Grouse (*Bonasa umbellus*) in Pennsylvania at the low of the cycle. M.S., Pennsylvania State College.

BOYER, GEORGE F. 1951. An ecological study of the marshes of the New Brunswick-Nova Scotia border region with special reference to waterfowl. M.S., University of Illinois.

BRODKORB, PIERCE. 1936. A revision of the genus *Empidonax* Cabanis. Ph.D., University of Michigan.

BROOKS, A.C. 1948. Cranial musculature in the Family Alcidae. B.A., University of British Columbia.

BUCHANAN, FOREST W. 1947. An ecological study of breeding birds of eastern Ohio in relation to the Flushing Escarpment. M.S., Cornell University.

CASEY, IRMA M. 1931. Correlation between the length of the wing, the area of the keel, and the mode of flight in birds. M.A., University of Kansas.

CHAMBERS, CHARLES. 1949. The air sac system in the Western Grebe. M.S., University of Washington.

CLARK, WEBSTER K., JR. 1947. The status of hybrid wild turkeys in Missouri. M.A., University of Missouri.

CLAYTON, BLANCHE P. 1949. The metanephros of the bird (histology, histochemistry, and cytology). M.A., University of British Columbia.

COFER, HOWARD H. 1939. A summary of information concerning the hawks, eagles, and vultures of Missouri including a general bulletin for public use. M.A., University of Missouri.

COMPTON, DOROTHY M. 1930. A study of the Downy Woodpecker, *Dryobates pubescens medianus*. M.S., Cornell University.

CRITCHER, TITUS S. 1949. An investigation of the waterfowl resources on Currituck Sound, North Carolina, during the 1947–1948 and 1948–1949 hunting seasons. M.S., North Carolina State College.

CURRIER, WARREN W. 1948. An ecological study of the vertebrates of a two-square mile area in Centre County, Pennsylvania. M.S., Pennsylvania State College.

DARSIE, JAMES C. 1939. Fall and winter food habits of the English Sparrow on the campus of North Carolina State College. M.S., North Carolina State College.

DAVIS, GRANT. 1951. A study of the population and biology of Ruffed Grouse in central Pennsylvania. M.S., Pennsylvania State College.

DEHNEL, PAUL A. 1948. Analysis of variation in some western races of the Hairy Woodpecker, *Dendrocopos villosus*. M.A., University of California.

DESHLER, GEORGE B. 1930. Relation of light intensity to avian activity. M.A., University of California.

DILGER, WILLIAM C. 1951. An introduction to the ornithology of India, including a bibliography. M.S., Cornell University.

DOUGLASS, DONALD W. 1934. The spring migration of birds at Sand Point, Huron County, Michigan, 1931–1933. Ph.D., University of Michigan.

EATON, STEPHEN W. 1949. The genus *Seiurus*: A comparative study of the species. Ph.D., Cornell University.

EDEBURN, RALPH M. 1938. A study of the distribution of breeding birds in a typical upland area. Ph.D., Cornell University.

EDMINSTER, FRANK C. 1930. A study of ornithological terms in common use. M.S., Cornell University.

EDWARDS, GLENN D. 1942. A comparative study of the leg muscles of some gallinaceous birds of the Pacific northwest. M.S., State College of Washington.

ELMORE, LA RUE J. 1935. A study of the sexual behavior of the Ruffed Grouse, *Bonasa umbellus* Linnaeus. M.S., Cornell University.

FAUQUET, EDNA D. 1930. The behavior and feeding habits of the California Jay, *Aphelocoma californica*. M.A., University of California.

FAWVER, BEN, JR. 1947. The bird and mammal population of an Illinois floodplain forest. M.S., University of Illinois.

FOWLE, C. DAVID. 1942. A preliminary investigation of certain birds' nests with reference to their environmental relationships. B.A., University of British Columbia.

GARRETT, MARY L. 1948. Life history of the Horned Lark. M.S., Ohio State University.

GORDON, KENNETH L. 1936. The application of the laboratory type of experiment to field studies of the behavior of chipmunks, winter birds, and some nesting birds. Ph.D., Cornell University.

GOULD, VICTOR E. 1932. A history of the Bob-white in New York State with particular reference to restocking. M.S., Cornell University.

HANSON, HAROLD C. 1943. Wildlife studies at Prairie du Sac. M.S., University of Wisconsin.

HAPP, GEORGE R. 1935. A study of the Flicker, *Colaptes auratus* (Linnaeus). M.S., Cornell University.

HARPER, FRANCIS. 1925. A faunal reconnaissance in the Athabaska and Great Slave Lakes region. Ph.D., Cornell University.

HARROWER, DAVID E. 1935. The habits of the passerine birds of Central America. Ph.D., Cornell University.

HAWKSLEY, OSCAR. 1950. A study of the behavior and ecology of the Arctic Tern, *Sterna paradisaea* Brünnich. Ph.D., Cornell University.

HAZEL, ROBERT B. 1950. A study of the biology, population, and management of the Ruffed Grouse (*Bonasa umbellus* subsp.) in central Pennsylvania. M.S., Pennsylvania State College.

HELM, LEWIS G. 1951. Effects of Canada Geese on crops and soils in central Missouri. M.A., University of Missouri.

HENDERSON, ELEANOR. 1933. Birds and mammals of Texas County, Oklahoma. M.A., University of Kansas.

HENSLEY, MARVIN M. 1948. Studies of the breeding bird population on the forest edge in Robert W. Allerton Park, central Illinois. M.S., University of Illinois.

HENSLEY, MARVIN M. 1951. Ecological relations of the breeding bird population of the desert biome in Arizona. Ph.D., Cornell University.

HEWITT, OLIVER H. 1944. Waterfowl food plants and the duck population at the head of Cayuga Lake. Ph.D., Cornell University.

HILL, LETCHEN A. 1933. The embryology of the free caudal vertebrae in the chick. M.A., University of Kansas.

HOYT, SARAH F. 1948. A reference book and bibliography of ornithological techniques. Ph.D., Cornell University.

JENKINS, DAVID H. 1942. Bob-white cover in Franklin County, Pennsylvania. M.S., Pennsylvania State College.

JOHNSTON, DAVID W. 1950. The relation of breeding bird populations and plant successions in Georgia Piedmont. M.S., University of Georgia.

KEITH, RALPH W. 1941. A winter study of birds and mammals in woodlots of central Pennsylvania. M.S., Pennsylvania State College.

KENYON, KARL W. 1941. A study of the old nest as a visual stimulus to the renesting of the Baltimore Oriole, *Icterus galbula* Linnaeus, including supplementary life history observations. M.S., Cornell University.

KINGSBURY, E. W. 1932. A study of the Hairy Woodpecker, *Dryobates villosus villosus*. M.A., Cornell University.

KINGSBURY, E. W. 1933. The status and natural history of the Bobolink—*Dolichonyx oryzivorus* Linnaeus. Ph.D., Cornell University.

KNAPPEN, PHOEBE M. 1926. A census of the birds nesting on the Cornell campus in 1926, compared with a similar census made in 1915. M.S., Cornell University.

KORSCHGEN, LEROY J. 1946. The late fall and early winter food habits of the Bobwhite Quail in Missouri. M.A., University of Missouri.

KOZICKY EDWARD L. 1948. Life history and management of the wild turkey (*Meleagris gallopavo silvestris*) in Pennsylvania. Ph.D., Pennsylvania State College.

KUHN, TRACY M. 1941. Part I. Availability of mast for wildlife. Part II. Fall food habits of the Ruffed Grouse (*Bonasa umbellus umbellus*). M.S., Pennsylvania State College.

KUTZ, HARRY L. 1940. Studies on the inhibiting influence of captivity upon reproduction in wild ducks. Effect of light and various gonadotropic hormones. Ph.D., Cornell University.

LAZAREFF, ANNE. 1949. The comparative histology of the digestive tract of meat, fish, and grain eating birds (oesophagus to duodenum). M.A., University of British Columbia.

LEE, FORREST B. 1948. A comparison of bird occurrence and activity in two climax forests at Itasca Park, Minnesota. M.S., University of Minnesota.

LEISTER, CLAUDE W. 1929. Food and feeding habits of the ducks of the Cayuga Lake region. Ph.D., Cornell University.

LEWIS, PRENTISS D. 1951. A partial gazeteer of South American collecting localities. M.S., Cornell University.

LOETSCHER, F. W. 1941. Ornithology of the Mexican state of Veracruz with an annotated list of the birds. Ph.D., Cornell University.

LONGWELL, JOHN R. 1951. A study of seasonal activities and cover preferences of the American Woodcock on a selected area in central Pennsylvania. M.S., Pennsylvania State College.

LOUGHERY, ALAN G. 1951. A food habit study of juvenile Ring-necked Pheasants on Pelee Island, Ontario. M.S., University of Western Ontario.

LUNGSTROM, LEON G. 1946. Comparative microscopic study of the proventriculus and duodenum of the Mourning Dove, Red-headed Woodpecker, and Meadowlark. M.S., University of Kansas.

MCCABE, ROBERT A. 1949. A ten-year study of a refuge population of Ring-necked Pheasants. Ph.D., University of Wisconsin.

MCDONALD, JEAN G. 1936. Avian bone marrow under experimental conditions. Ph.D., University of Minnesota.

MENG, HEINZ K. 1951. The Cooper's Hawk, *Accipiter cooperii* (Bonaparte). Ph.D., Cornell University.

MERRY, KATHERINE 1941. A study of the life history of the Eastern Phoebe—*Sayornis phoebe* Latham. Ph.D., Cornell University.

MULFORD, ALICE S. 1937. Ecologic relations of the Brewer Blackbird (*Euphagus cyanocephalus minusculus*). M.A., University of California.

MUNRO, DAVID A. 1947. A preliminary study of the waterfowl of Burnaby Lake, British Columbia. B.A., University of British Columbia.

MURPHY, DEAN A. 1951. Mobility of Bobwhite Quail in Central Missouri. M.A., University of Missouri.

MUSGRAVE, JOHN K. 1909. Birds of Centre County, Pennsylvania. B.S., Pennsylvania State College.

NELSON, THEODORA. 1939. The biology of the Spotted Sandpiper. Ph.D., University of Michigan.

NORRIS, RUSSELL T. 1941. An ecological study of the relationships between forest types and the wildlife species found thereon. M.S., Pennsylvania State College.

OATMAN, MRS. EDWARD 1945. Pterylosis in Black-crowned Night Heron, *Nycticorax hoactli* (Gmelin). M.S., University of Buffalo.

OWEN, OLIVER S. 1950. The bird community of an elm-maple-ash swamp in central New York. Ph.D., Cornell University.

PARKES, KENNETH C. 1948. A survey of published colored illustrations of North American birds. M.S., Cornell University.

PARMALEE, PAUL W. 1949. An analysis of development and behavior of the young Crow. M.S., University of Illinois.

PAULLUS, KATHERYN L. 1947. Wing-length, molt, and productivity of Bob-white Quail in Missouri in 1945 and 1946. M.A., University of Missouri.

PHILLIPS, ALLAN R. 1946. The birds of Arizona. Ph.D., Cornell University.

PHILLIPS, VIOLA A. 1936. A study of *Spinus tristis tristis* with special reference to the breeding habits at Ithaca, New York. M.S., Cornell University.

PIRNIE, MILES D. 1928. The plumage changes of certain waterfowl. Ph.D., Cornell University.

PRESCOTT, KENNETH W. 1950. A life history study of the Scarlet Tanager (*Piranga olivacea*). Ph.D., University of Michigan.

QUAY, THOMAS L. 1948. Ecology of the Savannah Sparrow in winter at Raleigh, North Carolina. Ph.D., North Carolina State College.

RANKIN, WALLACE H. 1938. The life history and distribution of the Chipping Sparrow, *Spizella passerina passerina* (Bechstein). M.S., Cornell University.

REESE, ROBERT W. 1949. Comparison of forest-edge bird populations in Robert W. Allerton Park, central Illinois, 1946, 1947, 1948. M.S., University of Illinois.

RICHTER, WILMER O. 1948. Singing ground analysis and cover preference of the American Woodcock (*Philohela minor*) in central Pennsylvania. M.S., Pennsylvania State College.

RUCK, PHILLIP R. 1949. Studies on the muscles of the pelvic appendage in certain anseriform birds. M.S., State College of Washington.

SARGENT, WILLIAM. 1936. The training of a Red-tailed Hawk. M.A., Cornell University.

SAUNDERS, GEORGE. 1932. A taxonomic revision of the meadowlarks of the genus *Sturnella* Vieillot, and the natural history of the Eastern Meadowlark, *Sturnella magna magna* (Linnaeus). Ph.D., Cornell University.

SHEADS, RICHARD D. 1951. A study of the Ruffed Grouse on the Stone Valley experimental forest in Huntington County, Pennsylvania. M.S., Pennsylvania State College.

SHIBLEY, JOHN 1949. Blood volume in birds. M.S., University of Georgia.

SHICK, CHARLES 1942. Progress of prairie farm pheasant studies April 1941 to January 1, 1942. M.S., University of Pennsylvania.

SHIRLING, ALBERT 1917. A preliminary report on the birds of Swope Park, Kansas City, Missouri. M.A., University of Kansas.

SMITH, S. LEON. 1939. The relation of edge growth to the bird and insect populations of two selected farming areas in Callaway County, Missouri. M.A., University of Missouri.

SMYTH, JAMES A. 1933. The literature of the Virginia Rail. M.S., Cornell University.

SMYTH, THOMAS. 1923. A study of the food and feeding habits of the Ruffed Grouse. M.A., Cornell University.

SMYTH, THOMAS. 1925. Studies in the life history of the Ruffed Grouse. Ph.D., Cornell University.

SOWLS, LYLE K. 1951. A study of the ecology and behavior of some surface-feeding ducks. Ph.D., University of Wisconsin.

SPRINKLE, CHARLES R. 1935. Behavior of the Spotted Towhee (*Pipilo maculatus*). M.A., University of California.

STADELMAN, WILLIAM J. 1942. Nutritional studies with Ring-necked Pheasants. M.S., Pennsylvania State College.

STAEBLER, ARTHUR E. 1949. A comparative life history study of the Hairy and Downy woodpeckers (*Dendrocopos villosus* and *Dendrocopos pubescens*). Ph.D., University of Michigan.

STOUDT, JEROME H. 1940. A waterfowl census technique and its application on the Chippewa National Forest. M.S., University of Minnesota.

STUDHOLME, ALLAN T. 1941. Ruffed Grouse (*Bonasa umbellus umbellus*) environment in the scrub oak-pitch pine forest type. M.S., University of Pennsylvania.

SWANSON, GUSTAV A. 1937. Studies on trematodes of the superfamily Strigeoidea with especial reference to the species from hawks and owls. Ph.D., University of Minnesota.

SYLVESTER, WALTER 1943. A bio-ecological study of the chestnut oak forest. M.S., Pennsylvania State College.

TANNER, JAMES T. 1936. Sound recording for a natural history museum. M.S., Cornell University.

TANNER, WARD D. 1948. A population study of the Ruffed Grouse (*Bonasa umbellus monticola*) in Pennsylvania at the low of the cycle. M.S., Pennsylvania State College.

TENER, J. S. 1948. An investigation of some of the members of the sub-family Anatinae in the lower Fraser Valley of British Columbia. B.A., University of British Columbia.

TEST, FREDERICK H. 1935. Bird weight and its significance. M.A., Cornell University.

TRAINER, JOHN E. 1946. The auditory acuity of certain birds. Ph.D., Cornell University.

VAJJAKICH, L. S. 1933. A study of a bird collection from Siam. M.S., Cornell University.

VAN HORN, DONALD H. 1952. Breeding-bird populations of floodplain and upland forests in central Illinois. M.S., University of Illinois.

WARNER, DWAIN W. 1947. The ornithology of New Caledonia and the Loyalty Islands. Ph.D., Cornell University.

WEISE, CHARLES M. 1951. Breeding populations and reproductive success of birds of the forest and forest edge in central Illinois. M.S., University of Illinois.

WESTERSKOV, K. E. 1949. A comparative study of the ecology and migration of the European Partridge in Ohio. M.S., University of Ohio.

WHITNEY, GAIELY. 1935. A study of the voices of birds in Kansas. M.A., University of Kansas.

WIGHT, HOWARD M. 1950. A study of the agricultural and environmental changes that have influenced Ring-necked Pheasant populations over a ten year period in Lehigh County, Pennsylvania. M.S., Pennsylvania State College.

WILKIN, WILLIAM C. 1937. The osteology and myology of *Anas platyrhynchos* Linnaeus. B.A., University of British Columbia.

WILSON, LEO K. 1923. The natural history of the California Jay. M.A., University of California.

WRIGHT, BRUCE S. 1947. The Black Duck in eastern Canada—a study of the breeding ecology. M.S., University of Wisconsin.

YEAGER, RALPH W. 1947. Breeding populations of Woodcock (*Philohela minor*)—in central Pennsylvania. M.S., Pennsylvania State College.

THE COMMITTEE ON RESEARCH

(*Donald S. Farner, Herbert Friedmann, S. Charles Kendeigh, Ernst Mayr, Alden H. Miller, Margaret M. Nice, Albert Wolfson*, Chairman.)

GENERAL NOTES

Additional Data on the Food of the Whooping Crane.—Until recently no analysis of stomach contents of *Grus americana* has been available, and up to this time none is recorded in the literature. When my monograph on this rare species was in preparation (The Whooping Crane, Research Report No. 3, National Audubon Society, 1952), it was necessary to draw conclusions with regard to feeding habits from examination of droppings, direct observation of feeding birds, and inspection of feeding areas. Although 45 food items are listed from these sources, it is considered that only seven of these are of major importance as food of the Whooping Crane on their wintering range in coastal Texas, where most of the detailed field work was centered. All seven of these are animal in character. Considering the list as a whole, 62 per cent of the items given are animal and 38 per cent are vegetable.

Thanks to the cooperation of Dr. Harvey I. Fisher of the University of Illinois, who preserved the stomach contents of a specimen sent to him for study, and to Francis M. Uhler of the U. S. Fish and Wildlife Service, who analyzed these contents, we can now add to this picture with the following data. One insect and two species of mollusks are entirely new on the Whooping Crane's food list, while two additional species are listed—one a mollusk and another a plant—for which only the genera were previously known. The results of Mr. Uhler's examination follow:

Animal Items	*Per Cent*
Fragments of several crayfish (*Cambarus* sp.)	30
Fragments of many snails including the following:	
Many orb snails (*Helisoma* sp.)	28
3 common periwinkles (*Littorina irrorata*)	10
5 + *Cerithidea aguayoi*	8
4 + bladder snails (*Physa* sp.)	6
Cricket (*Gryllidae*)	trace
	82
Vegetable Items	
Remain of several acorns (*Quercus virginiana*)	16
1 tuber from *Cyperus* sp. (probably *C. rotundus*)	2
	18

Five of the above items were previously listed as Whooping Crane food: the periwinkle by observation, the crayfish and acorns by both observation and analysis of droppings, and the *Cerithidea* snail and sedge tuber (*Cyperus* sp.) by droppings analysis. The cricket and the orb and bladder snails have not been recorded as food for this species, while specific determinations were heretofore lacking for the *Cerithidea* snail and the sedge.

The contents of the stomach made up only 16 cc. of material. No grit or other foreign matter was present. It should be mentioned that the crane from which this stomach was secured died of gunshot wounds on the Aransas National Wildlife Refuge in Texas, March 25, 1948. It had lost the use of its left wing as a result of a previous wound, but had been doing well on the refuge until it wandered to the exposed boundary along the Intracoastal Waterway and was shot a second time, probably from a boat or tug passing through this unfortunately located channel. At the time of death it was thin and weak and weighed only 10 lbs. and 5 ounces.—ROBERT P. ALLEN, *National Audubon Society, Tavernier, Florida.*

Starlings nesting at Churchill, Manitoba.—The most northerly point in North America, except for Greenland, where the Starling (*Sturnus vulgaris*) has been reported is Churchill, Manitoba, on Hudson Bay at 58° 45′ north latitude. The Starling was first seen here by Ralph S. Palmer in June, 1940, when he found an individual but no evidence of nesting (1941, Canadian Field-Naturalist, 55: 52).

In the summer of 1952 several pairs nested successfully at Churchill. On June 8 and June 11, I watched at least four pairs feeding young. I was not able to climb to the nests, but from the calls of the young at the approach of the adults, I judged they were almost ready to leave. So when I found no Starlings near the nests on June 14, I concluded the young had left. A number of immatures were noted in a flock of about 60 Starlings seen in the vicinity by Mrs. Eva Beckett on June 24 and on several occasions thereafter.

The nests were located under the conveyor, which slants upward from the base of the grain elevator to the ship-loading dock. This conveyor is completely enclosed, but the corrugated siding does not fit snugly to the supporting girders at all points. Here, between the siding and the girders at estimated heights of 60 to 70 feet, the Starlings find cavities suitable for nests.—HAROLD MAYFIELD, *2557 Portsmouth Ave., Toledo 13, Ohio.*

Nesting and Food of the Barn Owl (*Tyto alba*) in Hampshire County, Massachusetts.—Barn Owls were discovered breeding on the administration building of Mount Holyoke College in the summer of 1951. The four young had left the 'nest' by the second week of September. This means that the eggs had been laid early in June, since the incubation period is 30 days (Wallace, 1948) and it takes approximately two months for the nestlings to reach the stage where they are able to fly from their nesting quarters (Bagg and Eliot, 1937). From the fall of 1950 to the spring of 1951, 28 Barn Owl pellets had been collected in a nearby section of the campus and especially near an old, no-longer used schoolhouse, located directly west of the administration building. Possibly the birds had roosted there, and when the building was demolished in the spring of 1950, they sought refuge in the nearest available building.

According to Campbell (1952) the pair of Barn Owls that was located in Belchertown in the summer of 1951 established the third known breeding record for western Massachusetts. However, since their eggs failed to hatch, the rearing of young owls in South Hadley constitutes the third successful breeding record for this area.

The nesting site was on the front balcony of the third story, a site very similar to that described by Phillips (1951). The balcony faced west, and the portion used for the nest was approximately 8 feet by 1 foot. After the young had left the nest, it was found that the floor was covered to a depth of 15 inches with bones, fur, and fecal remains, but no whole pellets were present. This material was collected and later analyzed. Wallace (1948) noted that the female Barn Owl deliberately breaks up the regurgitated pellets to form a nest for her offspring. Although their decomposition is accelerated by rain, they may remain whole for 8 to 10 weeks (Wilson, 1938). Thus the absence of entire pellets in the nesting debris of the present study was not surprising, since it had been accumulating over a period of at least three months.

The 28 Barn Owl pellets that had been previously collected were also analyzed. They were oval and black, and seven of them, after having been stored for several months, averaged 7.6 grams in weight with a range of 3 to 11 grams. Wallace (1948) recorded an average dry weight of 6.8 grams for the 254 pellets he examined. The average dimensions of the pellets were 65.6 mm. by 32.7 mm., and they ranged

from 37 mm. × 25 mm. to 85 mm. × 31 mm. Measurements of Barn Owl pellets had been previously recorded as 3" × 1," i.e., 76 mm. × 25 mm. (Eliot, 1932); 50 mm. × 31 mm. (Wilson, 1938) and 53 mm. × 30 mm. (Wallace, 1948).

For both the 28 pellets and the nesting site material, skulls were saved for identification purposes and the mandibles counted so as to obtain an estimate of the number and kind of animal prey consumed. Sincere appreciation is accorded to Dr. W. J. Hamilton, Jr. of Cornell University and Mr. Andrew Starrett of the University of Connecticut for aid in identification of the material. The 28 pellets contained an average of 2.8 animals, 6 being the largest number present in a single one. Corresponding figures in the literature are 3.1 and 7 (Wilson, 1938) and 2.7 and 8 (Wallace, 1948). The results of the analysis are given in the following table.

FOOD OF THE BARN OWL AT SOUTH HADLEY, MASSACHUSETTS, EXPRESSED AS PER CENT OF THE TOTAL NUMBER OF INDIVIDUALS TAKEN

Prey species	*Pellets from roost (78 individuals)*	*Material from nest site (442 individuals)*	*Total (520 individuals)*
Starnose Mole (*Condylura cristata*)	2.6	10.9	9.6
Hairytail Mole (*Parascalops breweri*)	2.6	0.9	1.2
Shorttail Shrew (*Blarina brevicauda*)	26.7	17.4	18.8
White-footed Mouse (*Peromyscus leucopus*)	3.9	1.4	1.7
Meadow Vole (*Microtus pennsylvanicus*)	60.3	64.9	64.2
Norway Rat (*Rattus norvegicus*)	2.6	0.7	1.0
House Mouse (*Mus musculus*)	0.0	0.2	0.2
Meadow Jumping Mouse (*Zapus hudsonius*)	1.3	2.7	2.5
English Sparrow (*Passer domesticus*)	0.0	0.7	0.6
Unidentified amphibians	0.0	0.2	0.2
Total	100.0	100.0	100.0

Compared with similar investigations, the present study shows a relatively large number of moles (10.8 per cent). Forbush (1927: 193) stated that "the food of the Barn Owl in the east consists almost entirely of mice and rats, with some other small mammals and a very few birds." Again, Stearns (1950) obtained a 90 per cent incidence of *Microtus* and 10 per cent of *Blarina* in examination of several hundred pellets from Barn Owls in New Jersey. The frequency of shrews was fairly high though not as great as that reported by Price (1942) and Kirkpatrick and Conway (1947), namely 25.7 and 26.6 per cent, respectively. The combined percentage for all the insectivores in our study was approximately 30. As a result of this high incidence there was a correspondingly lower precentage of *Microtus*. The evidence that amphibians had contributed to the diet of these Barn Owls is of interest. The South Hadley data differ from those secured in an analysis of pellets from the neighboring Barn Owls in Springfield, in the presence of moles, many more shrews, but considerably fewer jumping mice, rats, and birds. In the Springfield collection, the higher incidence of rats and birds (mostly English Sparrows and Starlings) may be accounted for by the location of the nesting sites which were in the heart of the city. Phillips (1951) observed a similar condition in which the

nesting territory in the country revealed only 0.7 per cent bird remains compared with a 2.4 per cent bird content from two locations in the city. In contrast to this, South Hadley is rural, and the abundance of sandy soil with several lakes and streams scattered in the vicinity makes ideal environments, especially for the Hairytail and Starnose moles. Availability probably determines the kind and number of prey consumed by Barn Owls.

Literature Cited

Bagg, A. C., and Eliot, S. A., Jr. 1937. Birds of the Connecticut Valley in Massachusetts. (Hampshire Bookshop, Northampton, Mass.) lxxiv + 813 pp.

Campbell, L. 1952. Not "Bats in Our Belfry"—Owls. Bull. Mass. Aud. Soc., 36: 3–11.

Eliot, S. A., Jr. 1932. Goshawk and Barn Owl breeding in Massachusetts. Bird-Lore, 36: 1–4.

Forbush, E. H. 1927. Birds of Massachusetts and other New England States. Part II (Norwood Press, Norwood, Mass.) 1 + 461 pp.

Kirkpatrick, C. M., and Conway, C. H. 1947. The winter foods of some Indiana owls. Amer. Midland Nat., 38: 755–766.

Phillips, R. S. 1951. Food of the Barn Owl, *Tyto alba pratincola*, in Hancock County, Ohio. Auk, 68: 239–241.

Price, H. F. 1942. Contents of owl pellets. Amer. Midland Nat., 28: 524–525.

Stearns, E. I. 1950. Pampering Barn Owls. Aud. Mag. 52: 178–183.

Wallace, G. J. 1948. The Barn Owl in Michigan; its distribution, natural history and food habits. Tech. Bull., Agric. Exp. Sta., Michigan, 208: 1–61.

Wilson, K. A. 1938. Owl studies at Ann Arbor, Michigan. Auk, 55: 187–197.

—Elizabeth M. Boyd and Joan Shriner, *Department of Zoology, Mount Holyoke College, South Hadley, Massachusetts.*

The Black-crested Titmouse of Trans-Pecos Texas.—In an earlier report (J. Van Tyne and G. M. Sutton, 1937. Univ. Mich. Mus. Zool. Misc. Publ. No. 37: 63) attention was called to some of the characters which distinguish the Black-crested Titmouse (*Parus atricristatus*) population of Brewster County, Texas. I have since been able to study more adequate material from that county and from Jeff Davis County and I propose that this form be called

Parus atricristatus dysleptus, new subspecies

Type.—University of Michigan Museum of Zoology No. 65256; adult male; Texas, Brewster County, 5 miles south of Alpine, at 5,000 feet; February 15, 1935; collected by J. Van Tyne.

Characters.—Similar to *Parus atricristatus atricristatus* Cassin, described from "the Rio Grande, Texas," but the tail and wing considerabiy longer; crest shorter and broader; the black of crown and crest extending farther (to the nape and sometimes to the hind neck); and upper parts grayer (less olive).

Similar to *Parus atricristatus sennetti* (Ridgway), described from Bexar County, Leon Springs, but the crest shorter and broader, and the black of crown and crest deeper (not slaty), extending farther (to the nape and sometimes to the hind neck); the upper parts grayer; under parts whiter; and the cinnamon-rufous on flanks more extensive and, at least usually, darker.

Similar to *Parus atricristatus paloduro* (J. O. Stevenson, 1940. Proc. Biol. Soc. Wash., 53: 15), described from Armstrong County, Palo Duro Canyon, Harrell Ranch, but the wing slightly, the tail markedly, shorter; crest shorter and broader;

the black of crown and crest extending farther (to nape and sometimes to the hind neck); upper parts paler and grayer (less olive); and under parts whiter.

The above description is based on adult specimens in good plumage. Breeding specimens collected later than about May 1 are usually very worn and faded and not readily identifiable to subspecies.

MEASUREMENTS OF *Parus atricristatus*

	Range	*Mean (with standard error)*		*Standard deviation*	*Coefficient of variation*
		WING			
atricristatus					
23 ♂♂	67.0—75.5	71.09	±0.45	2.16	3.04
21 ♀♀	65.0—72.5	69.19	±0.38	1.73	2.50
sennetti					
21 ♂♂	74.0—78.5	76.38	±0.29	1.31	1.71
8 ♀♀	71.0—78.0	73.4			
dysleptus					
14 ♂♂	75.0—81.5	77.61	±0.51	1.89	2.44
6 ♀♀	72.0—75.0	73.7			
paloduro					
7 ♂♂	77.0—80.0	78.2			
5 ♀♀	75.0—79.0	77.5			
		TAIL			
atricristatus					
23 ♂♂	57.0—65.0	61.85	±0.48	2.28	3.69
21 ♀♀	56.0—63.0	60.48	±0.36	1.67	2.76
sennetti					
18 ♂♂	64.0—70.5	66.83	±0.45	1.89	2.83
7 ♀♀	62.0—68.0	64.6			
dysleptus					
15 ♂♂	63.0—70.0	66.70	±0.44	1.69	2.53
6 ♀♀	61.5—64.0	62.8			
paloduro					
7 ♂♂	67.5—73.0	69.8			
4 ♀♀	67.0—70.0	68.7			

For the loan of specimens I am indebted to the U. S. National Museum (42 skins) and the Chicago Academy of Sciences (6 skins). I wish to express my warm appreciation to George Miksch Sutton for the use of his data on this species, and to Keith L. Dixon, Herbert Friedmann, Howard K. Gloyd, Alden H. Miller, and Robert W. Storer for kind assistance of many sorts.—JOSSELYN VAN TYNE, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

The Yellow-billed Loon (*Gavia adamsi*) in Colorado.—The Yellow-billed Loon was placed on the list of Colorado birds by the late Wells W. Cooke (Further notes on the Birds of Colorado, Bull. 44, Tech. Ser. 4: 155, Fort Collins, Colo., Mar. 1898) on the strength of a specimen in the collection of Manly Hardy of Brewer, Maine. It was recorded as a young male, collected on May 25, 1885, at Loveland, Colorado, by W. G. Smith. This record was included in the third edition (1910) of the A.O.U. Check-List of North American Birds, and it also was repeated by W. L. Sclater in his "A History of the Birds of Colorado" (Witherby and Co., London, 1912, p. 11).

After examining the specimen, which had finally become a part of the collections of the Park Museum in Providence, Rhode Island, A. C. Bent published a note (Condor, 17: 130, 1915), in which he definitely established the fact that this bird was not *adamsi* but "a very curious specimen of a Common Loon (*Gavia immer*)." He went on to say that "Its bill is certainly yellow, the yellowest or lightest colored bill I have ever seen in any young Loon . . . but the size and shape of the bill agrees with *Gavia immer* and not with *G. adamsi*."

It appears, however, that *adamsi* must be restored to the list on the strength of a specimen taken at Brighton, Adams County, Colorado, on November 7, 1922, by F. J. Smith. It is curious that both of these specimens should have been collected by men named Smith, but we have no knowledge of any relationship. This specimen, in the collections of the Denver Museum of Natural History, is also an immature bird, but is unsexed. It has been compared with specimens in similar plumage of undoubted *immer* and *adamsi*, in the collections at Denver and in the U. S. National Museum. The tip of the bill is damaged so that its exact length cannot be determined, but (as pointed out by Bent), the shape of the bill, particularly the angle of the anterior half of the lower mandible, appears to be diagnostic. Other measurements are readily matched by specimens of *adamsi* taken in Arctic Alaska.—ALFRED M. BAILEY, *Denver Museum of Natural History, Denver, Colorado* and FREDERICK C. LINCOLN, *U. S. Fish and Wildlife Service, Washington, D. C.*

On the Correct Names for the Caracaras and for the Long-winged Harrier.—The name *Falco brasiliensis* Gmelin 1788 and the genus *Polyborus* Vieillot both have as their type a miniature colored drawing by Marcgrave in his Historia Naturalis Brasiliae of a raptor he called the "Caracara." In a paper on Marcgrave's birds (1938, Journ. für Ornith., 86: 94), Schneider reproduced this drawing in black and white and decided that it represents not a caracara but the harrier known for a long time as *Circus buffoni* (Gmelin). Schneider proposed to replace *Polyborus* as the generic name for the true caracaras by the later *Caracara* Merrem and to substitute the name *brasiliensis* for *buffoni* as the name of the Long-winged Harrier. The latter action, though unfortunately followed by Hellmayr and Conover (1949, Cat. Birds Americas, 13, pt. 1, no. 4: 224) is unnecessary in any case since *brasiliensis* and *buffoni* were described by Gmelin in the same work. Page priority alone is involved and this under the Rules is not allowed as a basis for changing an established name.

Professor E. Stresemann, who at first was inclined to agree with Schneider's determination, wrote to me (February 8, 1954) that because no harrier has apparently been recorded from northeastern Brazil he now feels doubtful about the determination of the drawing as a Long-winged Harrier. "I therefore would prefer to declare the drawing as unidentifiable. In this way the name *Circus buffoni* will be retained for the Long-winged Harrier."

Now to consider the fate of the generic name *Polyborus*. Hellmayr and Conover (*op. cit.*, p. 281) stated that "the generic features of *Polyborus* were undoubtedly taken from *Falco plancus* [that is, from the true caracara] . . . as is shown by Vieillot's subsequent detailed account (in Nouv. Dict. Hist. Nat., nouv. ed., 5, p. 256)." Nevertheless they rejected this name because Vieillot had listed as its only species the "Caracara"; said caracara being based indirectly upon Marcgrave's drawing. But we have seen that this drawing is essentially unidentifiable and may, indeed, be of a caracara, which is what Marcgrave called it. Everyone admits that Vieillot's diagnosis of *Polyborus* applies to the caracaras, and under these circumstances the diagnosis sustains the name. Merrem's name may again go back into synonymy. The status of the name *Falco brasiliensis* is of less moment, inasmuch as Hellmayr and Conover (*op. cit.*, p. 283) consider that the caracaras of Brazil, and northern South America generally, are not separable from the nominate race, *Polyborus p. plancus*, with type locality at Tierra del Fuego.—D. Amadon, *American Museum of Natural History, New York, N. Y.*

Two Species New to the Mexican Avifauna.—While in Chiapas, Mexico, in 1952, I collected the following two species which do not appear to have been recorded previously from Mexico.

Dendrocolaptes picumnus puncticollis Sclater and Salvin. On September 22, within an area of pines eight kilometers east of San Cristóbal Las Casas, at an altitude of 2400 meters, a single individual of this species was observed and collected. It was a non-breeding female in fresh plumage and weighed 59.1 grams.

The species, which is fairly widely distributed in South America, is rare and local in Central America. This record represents a considerable extension of range for the form, which was known only as far north as Alta Vera Paz, in eastern Guatemala.

Icterus maculi-alatus Cassin. A breeding male, which weighed 39.6 grams, was taken on August 6 in a low forest 10 kilometers west of Tuxtla Gutiérrez at an altitude of 800 meters.

The species has heretofore been recorded only on the Pacific slope of Guatemala. At the time the specimen was collected, it was assumed to be the sibling species *Icterus wagleri*, which is common in the region, and no notice was taken of the relative abundance of the two forms. Sr. Miguel Alvarez del Toro, of the Museo Zoologico in Tuxtla Gutiérrez, informs me (*in litt.*) that he has collected *Icterus maculi-alatus* on a number of occasions near the town and that it is so common he was unaware that its occurrence in Chiapas had not been recorded previously. Undoubtedly there are more unrecorded specimens in other museums.—Raymond A. Paynter, Jr., *Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.*

Reverse Mounting in the the Starling (*Sturnus vulgaris*).—On April 20, 1950, while I was observing a nesting pair of Starlings, I became aware of a very odd and perhaps characteristic mating behavior of this species. On 2:30 of this day, Starling A entered the nest with a small twig. After A had disappeared into the nest, B flew to the telephone wire directly opposite the nest. In a few seconds A joined B on the wire and mounted B but immediately returned to perch alongside its mate whereupon B assumed the upper position and definitely copulated with A.

Since the observations were made on four consecutive days and the reverse mounting phenomena observed several times on each of these days, it is logical to assume that reverse mounting was a part of the mating procedure of these two birds and that the female Starling of this pair solicited copulation by imitating the treading of the male.—Bruce Glick, *2062 17th Ave., Columbus, Ohio.*

Color Phases of the Screech Owl between Madison, Wisconsin, and Freeport, Illinois.—Between June 8, 1932, and March 27, 1950, a period of 18 years, I made 693 trips between Madison, Wisconsin, and Freeport, Illinois. These trips were uniformly distributed throughout the year. A total of 235 Screech Owls (*Otus asio*) killed by cars was examined. The distance between the above cities is 70 miles, of which 13 miles are in Illinois. It is of interest that approximately 75 per cent of the owls were found in Green County, Wisconsin, the road passing for the most part through what was originally rolling prairie. Here the owls were confined to farm buildings and the surrounding planted trees.

Pure gray birds were common but pure red birds were much less so. It was sometimes difficult to classify the intermediate phases, particularly the birds in juvenal plumage. The number in each of the two color phases is given in the following table:

Year	*1932*	*1933*	*1934*	*1935*	*1936*	*1937*	*1938*	*1939*	*1940*	*1941*
Red	6	4	4	1	4	3	3	15	3	7
Gray	8	1	5	6	12	9	3*	20	8	7
Total	14	5	9	7	16	12	6	35	11	14

* including one melanistic

Year	*1942*	*1943*	*1944*	*1945*	*1946*	*1947*	*1948*	*1949*	*1950*	*Grand Total*
Red	6	5	4	4	3	6	4	8	1	91
Gray	13	12	10	10	7	4	7	2	0	144
Total	19	17	14	14	10	10	11	10	1	235

The red phase formed 38.7 per cent and the gray phase 61.3 per cent of the total. Over 60 years ago, C. F. Carr (Wis. Naturalist, 1891, 1: 188) published a note at Madison stating that he had handled over 25 specimens from Wisconsin and had never met with the gray phase; also that the broods of young that he raised all acquired the red phase. If Carr's information is correct, there has been a radical local change, for the gray phase now predominates. J. H. Fleming (Auk, 1907, 24: 74) wrote from the vicinity of Toronto, Canada: "The red phase of plumage is rare, usually occurring for several years in succession and then disappearing." At no time during the period of my investigation did the red phase disappear. Furthermore, the number of specimens examined each year is too small to determine if there is a definite statistical difference between the two color phases from one breeding season to another.

An owl in the melanistic phase was found on the concrete road in Stephenson County, Illinois, on October 28, 1938. It had been flattened to a sheet by the traffic and would have been difficult to recognize as a Screech Owl it the feet had not remained attached. At a distance of a few feet the plumage appeared to be deep black but on closer inspection the color was sooty. This color phase appears to be very rare.—A. W. Schorger, *University of Wisconsin, Madison, Wis.*

Aspergillosis, Trichomoniasis, and Drug Therapy in a Gyrfalcon.—Fungal infections in birds and mammals are common. In birds, the species involved is generally *Aspergillus fumigatus*.

As a protozoan parasite of birds *Trichomonas gallinae* (Stabler and Herman, 1951), a flagellated inhabitant of the upper digestive tract and viscera, has few peers with respect to destructiveness.

The stimulating effect of certain antibiotics on protozoa and fungi is well known. *Trichomonas hominis* (Kleeberg and Birnbaum, 1950) and *Tetrahymena geleii* (Nardone and Blaszczynski, 1952) increased in numbers under the influence of aureomycin and streptomycin respectively.

Similarly, Seligmann (1952) described the enhancement of virulence of *Candida albicans* by aureomycin, and Wybel (1952) reported a fatal spinal cord mycosis ("probably due to *Aspergillus*") following penicillin therapy. In the Journal of the American Medical Association the editors (1952), and Kligman (1952) discuss the growing belief in the stimulation and increase of virulence of fungi following the administration of wide-spectrum antibiotics. In addition, Orie (1952) stresses "an underlying debilitating disease" as the basis for moniliasis of the human respiratory tract.

The case of a Gyrfalcon (*Falco rusticolus candicans*) which had all four of these influences seems worthy of record. It had protozoal (*Trichomonas gallinae*) and fungal (*Aspergillus fumigatus*) infections, an additional debilitating condition (severe wing bursitis), and experienced antibiotic (aureomycin) therapy.

In the fall of 1951 the Gyrfalcon landed on a ship which was some two days out of England, bound for the United States. It was eventually given to Col. R. L. Meredith, who trained it for falconry, and it passed an uneventful winter.

The following May (1952) its left wing was seen to have suddenly drooped, the bird refused to fly and became progressively weaker, though the appetite remained fairly good. The wing became worse, and 50 mg. of aureomycin per day for three days were administered. There was no improvement, and vitamin B_1 was injected in early June. This was followed by 50 mg. of aureomycin a day for two days, with a continued decline in the bird's condition by late June. By early July the falcon had become quite weak and listless, with virtually no appetite.

At this point the bird was sent to the writers, arriving in the morning of 11 July 1952. During that day, although attached to its customary perch, it sat hunched on the ground, eyes closed, refusing all food. Its breathing was quite labored and wheezy, the slightest exertion resulting in violent breathing efforts. Death intervened at 7:00 p.m. the day of arrival.

At necropsy the following was observed: the bird appeared to be an old one. It was in extremely poor condition, the pectoral muscles being drastically reduced. Undetermined mallophaga were numerous on the head and neck.

In the upper digestive tract the mouth was clean but for a small spot of doubtful etiology on the roof. The saliva was swarming with *Trichomonas gallinae*. The oesophagus and stomach were devoid of pathology. The crop, on the other hand, was completely closed off at the point where it joined the glandular stomach. The stricture was due to a tightly adherent, 10 mm. thick caseous formation which all but encircled the passageway. This firm mass extended some 4 cm. up the crop wall and surrounded the lumen like a ring, closing it and making the passage of food impossible. This type of caseation (called canker) is common in *T. gallinae* infections, and may occur in various places in the avian host. This organism was recovered in abundance from the Gyrfalcon's crop contents.

The abdominal viscera showed no pathology.

The respiratory and air-sac systems proved to be variously and severely infected with a fungus, *Aspergillus fumigatus*. Numerous colonies were observed on the surfaces of the thoracic air sacs, with more being found in the left sac which was completely lined with a thick, tough growth showing scattered patches of dark spores. Both passages to these sacs were likewise lined with sheets of *Aspergillus*, but were not occluded. The abdominal air sacs did not appear to be involved.

The left bronchus was completely occluded by a plug of fungus 2 cm. in length and lying just distal to the bifurcation. There was considerable extension of the aspergillosis into a bursal sac found in the left shoulder. Further, an elongated cyst lying in the muscle parallel to the posterior edge of the left humerus contained pus cells and fungal hyphae. The right shoulder was normal.

The trichomonads from the Gyrfalcon's crop were placed in the mouths of five *Trichomonas*-free homing pigeons. Only one survived. At necropsy 46 days after infection this pigeon showed evidence of having survived severe hepatitis typical of *T. gallinae* infection. The other four died of acute trichomoniasis, showing extensive caseation of the liver. This Gyrfalcon, then, harbored a very virulent strain of this flagellate.

The exact sequence of events which led to this falcon's death is difficult to determine. The bird certainly was under a variety of influences, which may have had important effects upon one another. Subsequent to capture it had been fed many pigeons, in all probability thereby acquiring its *T. gallinae* infection at an early phase of its captivity. Yet it manifested no symptoms of trichomoniasis through the winter months. If it had *T. gallinae*, were these organisms caused to increase or to become more virulent under the influence of the aureomycin? Certainly the trichomonads recovered from the crop at death were quite virulent.

The Gyrfalcon's left wing injury was severe. It was acquired probably during bating (the jumping of a hawk from the fist or perch while restrained by the leg straps—jesses). Antibiotics and debilitating conditions are indicated as contributing to resident fungal upsurge. This bird had most severe fungal involvement at death. As debilitating influences it had trichomoniasis (disease) and a shoulder sprain (injury), and it received antibiotic therapy (aureomycin). Since aspergilli are quite widespread in birds it is very likely that the *A. fumigatus* antedated all the above conditions.

What, step by step, led to the fatal condition seems difficult to state. It would appear wise, however, to caution against the empirical use of antibiotics in the light of the side effects so often attendant upon their administration. In man, the patient is usually under, or has just received, treatment with large doses of antibiotics at the time of fungal upsurge. In the present case, even though the dosage of aureomycin was not large and was given some weeks prior to death, the antibiotic might have tipped the balance from chronic to acute disease (trichomoniasis and/or aspergillosis).

The writers are most grateful to Ruth R. Pearson, bacteriologist at Glockner-Penrose Hospital, Colorado Springs, and to Dr. Kenneth B. Raper, Northern Regional Research Laboratory, Peoria, Illinois, for the determination of the Gyrfalcon's fungus.

Literature Cited

Editorial. 1952. Fungus infections complicating antibiotic therapy. Journ. Amer. Med. Assoc., 149: 762–763.

Kleeberg, F., and D. Birnbaum. 1950. Effect of aureomycin on *Trichomonas intestinalis hominis*. Nature, 166 (4232): 989.

Kligman, A. M. 1952. Are fungus infections increasing as a result of antibiotic therapy? Journ. Amer. Med. Assoc., 149: 979–983.

Nardone, R. M., and H. J. Blaszczynski. 1952. The effect of streptomycin, streptobiosamine and streptamine hydrochloride on *Tetrahymena geleii*. Proc. Soc. Protozool., 3 (Sept.): 12.

ORIE, N. G. M. 1952. *Candida* (*Monilia*) infection of the respiratory tract. Dis. of the Chest, 22 (1): 107–117.

SELIGMANN, E. 1952. Virulence enhancing activities of aureomycin on *Candida albicans*. Proc. Soc. Exp. Biol. Med., 79: 481–484.

STABLER, R. M., and C. M. HERMAN. 1951. Upper digestive tract trichomoniasis in Mourning Doves and other birds. Trans. 16th N. Amer. Wildlife Conf., pp. 145–163.

WYBEL, R. E. 1952. Mycosis of cervical spinal cord following intrathecal penicillin therapy. Arch. Path., 53 (2): 167–171.

—ROBERT M. STABLER and MARY ALICE HAMILTON, *Colorado College, Colorado Springs, Colorado.*

Ornithology in Barton's Medical and Physical Journal.—In the outstanding bibliographical contributions of Elliott Coues, Barton's magazine either is unnoticed or is labelled "not seen." It was a notable periodical for its time and deserves remembrance. Its title in full is: "The Philadelphia Medical and Physical Journal. Collected and arranged by Benjamin Smith Barton, M.D." All of it was published at Philadelphia. A collation of the volumes and parts is:

Vol. I. Part I. 1804. x + 185 pp.
Vol. I. Part II. 1805. vii + 192 + viii pp.
Vol. II. Part I. 1805. xii + 208 pp.
Vol. II. Part II. 1806. ix + 209 + [10] pp.
Vol. III. Part I. 1808. viii + 190 pp.
First Supplement. March 1806. [3] + 98 + [1] pp.
Second Supplement. 1807. pp. 103–201.
Third Supplement. May, 1809. iv + pp. 207–312.

The periodical included some plates, but they are lacking in the set examined. Disregarding the convention of brackets indicating that the name of the author has been supplied, it may be stated that only the last of Barton's contributions here listed was signed with his name; the others were "by the Editor."

Barton, Benjamin Smith.

Facts relative to the food of the hummingbird. I (I), 1804, pp. 88–89. (Takes insects and spiders as well as nectar.)

Note on the natural history of the substance called Guano. II (I), 1805, pp. 66–68. (Compiled.)

Ornithology. II (I), 1805, pp. 161–164. (Magpie taken on the Lewis and Clark Expedition; canvasback on the Susquehanna by his brother Matthias Barton; wild-celery as food of that species; wild turkey.)

Ornithology. First Supplement, March 1806, pp. 67–68. (Anhinga; charcoal for fattening poultry.)

A discourse on some of the Principal Desiderata in Natural History, and on the best means of promoting the Study of this Science, in the United-States. III (I), 1808, pp. 165–175. (Old accounts of torpidity of hummingbirds.)

Bartram, William

Anecdotes of an American crow. I (I), 1804, pp. 89–95. (Traits of a bird reared by hand: tractable, benevolent, docile, humble, prone to imitation, had an excellent memory, mischievous.)

Description of an American species of Certhia or Creeper. I (II), 1805, pp. 103–106. Pl. I. (The brown creeper; no binomial name.)

Ellicott, Andrew

Hints relative to Swallows. Second Supplement [1807], pp. 116–118. (Extracts on subaqueous torpidity of swallows from [Jean Francois] Regnard, Voyage into Lapland, 1681, Edition Stéréotype Vol. 5.)

Gregg, Amos

Memoranda on the natural history . . . of the Island of Hayti. II (II), 1806, pp. 18–23. (Birds, pp. 19–21.)

Peck, William D.

Tabula Avium alibi hiemantium tempore vernali adventum commonstrans. First Supplement, 1806, pp. 55–56. (Introductory remarks and table giving dates of arrival of 20 species at Kittery, Maine, during the years 1792 to 1800, inclusive.)

Vaughan, John, and Robert Milligan

Facts and observations relative to the North-American Woodcock. II (I), 1806, pp. 68–70. (Mating performance and song.)

Cessation of publication was for some unforeseen reason, as in the terminal section the Editor refers to a biographical sketch, "it is the intention . . . to give in a future number . . . ."—W. L. McAtee, *3 Davie Circle, Chapel Hill, North Carolina.*

Cassin's Kingbird in Canada.—On June 4, 1953, Mr. Alan Gordon, a forester with the Ontario Department of Lands and Forests, observed a strange kingbird "lazily flycatching from the tall shrubs along the beach" of Grand Lake, at Achray, in northeastern Algonquin Park, Ontario. On the following day (June 5) he secured the bird and prepared it as a specimen which was forwarded to the Royal Ontario Museum (no. 81283). The specimen proves to be an example (sex not determined) of Cassin's Kingbird (*Tyrannus vociferans*).

Except for the tertials the flight feathers are worn and the outer primaries are not emarginate. The rectrices are worn and relatively narrow. These features suggest that the specimen is a yearling. In color, tone, and size, it agrees with specimens from Arizona and California with which it was compared. Measurements in millemeters are as follows: length (by collector), 215; chord of wing, 126; tail, 90; length of bill from anterior edge of nostril, 14; width of bill through nostril, 8.8. The specimen is accordingly referred to the nominate race.

The species has not been recorded previously for Canada, and its occurrence northeastward far beyond its normal range is apparently unique.—L. L. Snyder, *Royal Ontario Museum of Zoology and Palaeontology, 106 Queen's Park, Toronto 5, Canada.*

Birds and Butterflies or Vice Versa.—During the third week in June, 1952, while driving along the Steece Highway (which runs in a north-easterly direction from Fairbanks to Circle, Alaska), I noticed a congregation of the Pacific Tiger Swallowtail (*Papilio rutulus*) "drinking" at a damp spot a few yards off to one side of the highway. After stopping the car to investigate and "flushing" the butterflies, it was noticed that there were many detached butterfly wings scattered over the ground where the insects had gathered. The probable reason for the presence of the wings soon became apparent when a White-throated Sparrow (*Zonotrichia albicollis*) was seen to make an unsuccessful attempt to catch one of the butterflies after the swarm had resettled on the damp patch of ground they had previously occupied.

Further evidence that birds actually catch and feed on butterflies assembling at favorite places, at least in this part of Alaska, was found a few days later while on a

collecting trip a few miles south of Fairbanks. In the bed of a stream or small river, swallow-tails were seen congregating in several different areas on the wet sand and gravel bars. Here, as before, many detached wings were scattered over the ground. In this case, however, there were more birds in attendance—White-throated Sparrows, Slate-colored Juncos (*Junco hyemalis*), and Alaskan Longspurs (*Calcarius lapponicus*).

Since no bird was actually seen to catch a butterfly, the attention of birds around the congregated swarms of butterflies and the presence of numerous detached wings found in the damp areas where these insects had assembled might represent only circumstantial evidence. Nevertheless, there is little doubt, at least in the writer's opinion, that birds were solely responsible for the presence of the detached wings. The Swallow-tail is a relatively large insect with a wing expanse of approximately three to three and one-half inches. It is therefore evident that it would be difficult for a bird of the size of a White-throated Sparrow to swallow one of these butterflies without first stripping its body of wings.

The reader may think "What is there unusual about this"? Butterflies assembling at damp places, at sap exuding from tree trunks in the spring or at garbage dumps or even on dead or putrifying animal matter, are a common sight to almost anyone who has travelled in rural areas during the time that butterflies abound. This is true, at least of any suitable place in *temperate* or *subtropical North America*. Various species of swallow-tails are conspicuous because of their relatively large size and striking coloration. Yet, while they are usually common and well distributed, the writer does not know of a single authentic record of any species of bird in the United States or Canadian territory, catching and removing the wings of swallow-tails or other species of butterflies assembling in numbers at damp spots. Neither has he observed any similar circumstances although he has collected lepidoptera in all but a few states of the Union during a period of over forty years. Why, then, should birds in the Fairbanks area resort to this method of feeding when it does not appear to have been witnessed elsewhere? Could it be that in this part of Alaska food material is relatively scarce (late in June) causing birds to supplement their diet by catching butterflies assembling in large numbers and thereby providing a concentration of food obtained fairly easily, at least with acquired experience? If so, why is it that this does not appear to happen in the United States or perhaps elsewhere?

This is not all. North of the Arctic Circle, from the northern slope of the Brooks Range to the Arctic coast, no butterflies of any species were seen to collect at damp areas either singly or in groups in spite of the fact that fourteen or more species were seen and collected. In the mountains or drier portions of northern Alaska another species of swallow-tail butterfly (*Papilio machaon*) occurs in sufficient numbers to be easily seen if it were in the habit of settling or congregating at wet places on the tundra or along the edges of lakes or rivers, yet none was seen to do so. The reason for this might be more easily explained than the difference in the feeding habits of the birds. For instance, it may be that because of the lower ambient temperature north of the Arctic Circle, insect metabolism is slowed down or reduced and consequently the water balance or moisture content of the insect's body is more easily maintained without the need for taking up moisture at mud puddles, etc. To substantiate this hypothesis, it seems to be a rule that the higher the temperature and the lower the humidity (and probably the greater the activity also) the stronger is the tendency for butterflies to collect at wet places for the purpose of maintaining or restoring their water balance. It might be of interest to mention in this connection that all butterflies collecting at suitable places for the purpose of obtaining moisture or soluble food material are *invariably males* and freshly emerged from pupae at that.

How birds can adapt themselves to unusual concentrations of insects was observed while camping at Chandalar Lake on the northern slope of the Brooks Range of mountains. Mosquitoes collected in large numbers on the outside of a white canvas tent two of us were using as living quarters. Several small flocks of immature Alaskan Longspurs soon "caught on" to the fact that the tent acted as an ideal trap or concentration camp for mosquitoes and diligently fed on them both day and night. At first (before knowing what was causing the disturbance) the longspurs were quite perturbing because one or more would lose their footing and slide down the inclined roof of the tent causing a ripping sound suggestive of someone or something trying to rip open the canvas.—GEORGE W. RAWSON, *180 Summit Avenue, Summit, New Jersey.*

The Laysan Albatross (*Diomedia immutabilis*) on the Oregon Coast.—On January 30, 1953, Ralph Swan, Fisheries Biologist with the Oregon Game Commission, and I were beachcombing at Sunset Beach, just south of the Columbia River mouth in Clatsop County, Oregon, when Swan found a dead albatross, recently cast ashore and in an excellent state of preservation.

The bird was presented to Stanley G. Jewett who prepared it as a study skin It proved to be an adult female in fine plumage. Jewett reported the stomach was empty and that the right wing was broken near the outer tip. This broken wing tip may have resulted in the death of the bird by starvation, and the Japanese Current may have carried the bird a considerable distance towards the Oregon coast in this interval. Jewett also noted that the bird's body was much emaciated, without any fat on the skin.

So far as the published records are available to us, this is the first record of the occurrence of this species on the North American coast north of southern California and constitutes a new bird record for Oregon. The specimen is now number 16,616 in the Stanley G. Jewett Collection.—TOM MCALLISTER, *3374 S. W. Fairmount Blvd., Portland 1, Oregon.*

RECENT LITERATURE

Annual Cycle, Environment and Evolution in the Hawaiian Honeycreepers (Aves: Drepaniidae).—Paul H. Baldwin. Univ. Calif. Publ. Zool., 52: 285–398, pls. 8–11, 12 figs. in text. 28 October 1953. Price, $1.50.—This important study is based primarily upon three species *Loxops virens*, *Himatione sanguinea*, and *Vestiaria coccinea;* the only three species of the family, incidentally, still fairly numerous and still present on a number of the Hawaiian Islands. Baldwin's results, therefore, are not to be regarded as clues to why so many Hawaiian honeycreepers became extinct, although some of his data, for example, the inability of a rarer drepaniid, *Psittirostra bailleui*, to recolonize one of two mountains on its home island of Hawaii, do bear upon this point. Baldwin was in the islands as Park Naturalist and in other capacities during parts of the years 1937–1946; in 1948 he returned for a full year of intensive work on the problems considered in this thesis.

Loxops virens proved to be a more or less typical territorial songbird. The male has a territorial trill, and also a more spirited song, uttered sparingly, usually in courtship or in active territorial disputes with other males. Molt, nesting, and other activities are on an annual cycle in this and the other species but, presumably because of the equable climate, proceed at a more leisurely pace than is possible in birds that breed in a short, northern summer. Some adult males of *Loxops* are in breeding condition and on territory by late October or November, though at this time they sometimes leave the area for days or even weeks at a time. Nesting begins after the first of the year, and other males, including birds a year old and some of the older ones, may not take up territory until shortly before nesting commences.

Himatione and *Vestiaria* belong to a different subgroup, one in whose diet nectar is more and insects are less important than they are in *Loxops* and its relatives. Adults of both sexes are brilliant red in the two nectar-eaters; in *Loxops* the male is yellow, the female green. Hence Baldwin was able to learn less about the nectar-specializing forms, especially since unlike *Loxops* they would not enter traps, but it was apparent that territory is but little developed in them. A presumed male *Himatione* was seen on occasion to fly at others near the nest on which his mate was sitting; but again he would ignore such interlopers and often he left the nesting area altogether. Both *Himatione* and *Vestiaria* sing or call throughout the year and probably the notes are uttered by both sexes, though a presumed female *Himatione* seemed silent at or near the nest; the male was vocal. *Vestiaria* is aggressive and noisy when excitedly feeding; but little evidence of territorial interest was observed. It, and also *Himatione*, have definite seasonal population movements, largely but not entirely synchronized with the appearance in abundance of nectar-bearing flowers in different areas. Their preferences in this respect are not identical and, furthermore, they differ considerably in size and in the length and curvature of the bill. Food is thus of significance in allowing the species to live together but can hardly be responsible for the annual cycle, for insects seem always abundant and nectar too, is always available in one area or another. The rains of the winter trade winds may be a deterrent to nesting at that time.

The above will suggest the wealth of detailed, often tabulated, information in this paper. Comprehensive studies of annual cycle in birds are few and far between, and how many of them relate to tropical birds, or to insular endemics, or to nectar-feeders, or to a comparison of representatives of two ecologically quite dissimilar subfamilies of a family? Here, for example, is data on annual cycle of fat deposition in species that are neither migratory nor subject to low winter temperatures (a

definite weight increase was found as the gonads approached and passed maximum size; at other seasons there was much individual variation in fat resources).

In a concluding section on evolution Baldwin has quite well demonstrated that the specialized nectar-eating genera, e.g., *Vestiaria*, seem surprisingly enough, to be the older original group of drepaniids. *Loxops* and the other insect-and fruit-eaters, though in several respects more generalized, evolved from them in a comparatively recent burst of adaptive radiation. A nice example of reversibility in evolution!—D. AMADON.

The Herring Gull's World: a Study of the Social Behaviour of Birds. NIKO TINBERGEN. Collins, London, xvi + 255 pp., 51 photos., 58 figs. in text. Price, 18 shillings.—In publishing this book, the editors of Collins New Naturalist Library have selected a work which represents a departure from the type of life history study illustrated by such earlier volumes of this series as "The Greenshank" and "The Yellow Wagtail." Their choice of author and subject is one of which they can be proud. Dr. Tinbergen is a leading student of animal behavior and in particular, he has studied the Herring Gull for over twenty years. Furthermore, he possesses the ability to write clearly and simply. The result is a book which not only gives the reader remarkable insight on the whys and wherefores of a Herring Gull's behavior but also achieves this in a thoroughly entertaining manner.

The book is divided into five sections: introduction; settling down in the colony, fighting, and territory; pair formation and pairing; incubation; and family life. Each section contains several chapters. From this it will be seen that the emphasis is on behavior during the breeding season; the activities of the birds at other seasons are only briefly discussed. The work is based primarily on many days of studying the birds in their natural surroundings; and this is supplemented by ingenious and deceptively simple experiments by which the author has been able to determine the reasons for, or functions of, many puzzling behaviorisms. In reading the book, one cannot help but come to a better understanding of the behavior of all birds and even of man.

The book is full of provocative ideas, one of the most intriguing being that of "supernormal" stimuli. By offering newly hatched young variously painted models of an adult gull's head—and other objects—and by noting the number of times the young pecked at (solicited food from) the different models, Tinbergen was able to judge the effectiveness of each model as a stimulus and to find out what part of the model stimulated the chick to solicit food. Several objects were found to be more effective than the normally colored head of an adult gull, and these objects were in many cases more complex in pattern. For instance, a round red spot like that on an adult's bill was less effective than a spot which was similar except for a light ring inside the red, forming a bull's-eye pattern.

This concept of a supernormal stimuli is extremely provocative. Perhaps most important is its potential value as an evolutionary mechanism whereby the selection of more complex patterns, not only of bills but also of other parts, may take place. Here we have something, possibly a pre-adaptation, by means of which we may be able to trace processes of evolution of both behavior and morphology. Tinbergen's experiments on these stimuli immediately suggest further experiments with different species of gulls. Similar studies on the California Gull, which has a black spot within the red spot on the bill, and the Ring-billed Gull with its black-banded yellow bill are two of the most obvious problems which come to mind. It is particularly gratifying to report that Tinbergen has organized a world-wide-cooperative project to study the comparative behavior of the different gulls. Undoubtedly many important discoveries will be made in the course of this work.

In any study of behavior, displays and postures are of extreme importance. To illustrate these parts of the Herring Gulls' behavior, Tinbergen has used many of his beautiful photographs and a series of simple line drawings, for the most part prepared from photographs. In describing the birds' actions, these illustrations are far more effective than many pages of text would have been. There are also points in the text where studies of the behavior of other animals are mentioned to shed light on the behavior of the Herring Gull; and, consequently we find figures of displays of the Three-spined Stickleback and other forms.

It is seldom that an author produces a book which should appeal to both beginning bird watchers and professional zoologists. "The Herring Gull's World" is such a book, and I heartily recommend it to everyone interested in birds. I might add that it should be studied by laboratory psychologists who too often forget the value of studying animals in their natural surroundings.—ROBERT W. STORER.

The Birds of the Belgian Congo. Part 3.—James P. Chapin. Bull. Amer. Mus. Nat. Hist., 75A: 1–821, 14 pls., 36 text figs. 20 May 1953.—The third volume of Chapin's great work on the birds of the Belgian Congo covers the first half of the Order Passeriformes, the second half of which is due to appear in a fourth and final volume. The families covered in the present part are the broadbills (*Eurylaimidae*), pittas (*Pittidae*), larks (*Alaudidae*), wagtails and pipits (*Motacillidae*), bulbuls (*Pycnonotidae*), cuckoo-shrikes (*Campephagidae*), babblers (*Timaliidae*), warblers (*Sylviidae*), thrushes (*Turdidae*), flycatchers (*Muscicapidae*), and swallows (*Hirundinidae*). Some 597 forms of birds are treated in detail while comparative notes or remarks on at least as many more are included, making this volume one of the primary repositories of data about African passerine birds.

As in the previous volumes, the discussions are based not only on Chapin's own material but on practically all of the relevant collections in the leading museums of Europe and America. They are, therefore, a summary of all that is known and not merely of that part available to the author. Chapin's life-long studies of African birds are hereby made available to his colleagues as well as to his successors. The fourth and final volume will bring to completion the most extensive single contribution to Old World ornithology made by an American. It need hardly be added that the present volume fully maintains the standards of excellence set by the first two.—HERBERT FRIEDMANN.

Fugletraekket og dets gåder (Bird Migration and Its Puzzles).—Finn Salomonsen. (Einar Munksgaard, Copenhagen), 224 pp., 8 pls., 60 text figs. 1953. Price, 19.50 Danish crowns.—A popular, but serious and scholarly account (in Danish) of bird migration by the leading ornithologist of Denmark, the country that pioneered in the study of migration by means of marked, or banded, birds. The volume opens with a general discussion of animal wanderings, and in the second chapter begins a survey of the various aspects of bird migration that have been studied. Then follow, successively, discussions of resident and migrant birds, of the direction and extent of the routes they follow, of the influence of external conditions on the movement of birds, the invasion of new areas by birds, orientation during migration, the physiological states and processes of migrant birds, and a short and cautious survey of theories of the origin of migration. The rest of the book (nearly half) is devoted to an annotated list of the migratory birds of Denmark, describing their routes, their wintering quarters, summer homes, and their status and dates in Denmark.

This volume brings up to date and supplants the author's earlier one of 1938 and gives every appearance of being able to give further information and enjoyment to the public that has used its predecessor for the past 15 years.—HERBERT FRIEDMANN.

The Web of Life. A First Book of Ecology.—John H. Storer. (New York: Devon-Adair Co.) 144 pp., 48 half-tone figures. Price, $3.00.—This book is a sort of elementary reader for the layman, the high-school senior or the college freshman wanting background, by desire or assignment, on the use of soils, water, forests, and wildlife from a point of view which stresses interrelations of things, living and non-living. The text is broken up into twenty more or less compact chapters, presenting in a clear way facts concerning physical environment, forest and grassland communities, soil and water resources, evolution and, finally, man's growing awareness of conservation problems. There is a two-page bibliography and an introduction by Fairfield Osborn.

The book should be useful to the audience it seeks. Its success will be lessened by a style of writing that drones and a text which somehow leaves an impression of duty fulfilled rather than inspiration realized. The excellent collection of photographs brought together in the middle of the book are so labeled that they may be examined separately, before or after reading the text, and these should stimulate a good many of those handling this book to read it.

To the more dedicated conservationists of the day, whose concern I share, criticism of a good, honest effort to communicate their message may seem almost to be an act of sabotage. And to tie together the facts of raw life into a neat package for the innocent is, I admit, not easy. But there are several features of this and other more or less similar pieces of writing to which I object and which I honestly believe impair the success of the effort expended.

One thing is that a reader's interest in the conservation point of view must be awakened with incisive argument based on clear fact and clear thinking. Should a book of this sort be started with pronouncements about the interdependence of it all? I find this old tune more and more tiresome. Sometimes broad statements concerning interdependence suggest a dreamy opening to a seance rather than a vigorous, confident entry into an arena fraught with debate. Such statements by a conservationist serve to let some readers know that he has become properly convinced of the soundness of a broad, ecological point of view. But what about the readers to whom all this is more or less new? All this talk about interdependence may be disillusioning because the beginner—particularly the practical and realistic citizen, young or old, whose notice we especially seek—is not going to see what the author says he will see, at least not for some time. I wonder how many of the readers of this book will end up with the "clear and comprehensive" picture its author promises them? The rest of his foreword sounds more like an invocation than a declaration of plan. Conservationists cannot expect to capture audiences by the frothy phrases drawn from the kind of ecology that is loaded with destiny. It would really be better to open with a few frightening statistics.

There is another old tune the evangelists of conservation might well drop. This is the one about balance of nature. One can examine a biota in an area and detect interactions which help to explain the composition and activities of that biota, but this does not mean that the system is so closed or regular as the word balance implies. Nor are the interactions necessarily *interdependences* in the literal sense of that word. Present-day teaching in ecology stresses instead that communities display a resiliency and a capacity for adjustment and compensation. And to bring this out as a part

of the business of man trying to encourage an area toward maximum productivity and usefulness really makes a more exciting picture than the vague balance which is there and yet it isn't there!

But this is hardly the place to continue in this vein. The point is that while conservationists are trying to be heard, there is ample room for continued re-study of how best they might try to be heard. On this score, I recommend a talk by Stanley A. Cain published in 1951 in the Proceedings of the Second Conference on Conservation of Natural Resources sponsored by several agencies of the state of California. My own feeling is that while books like this one by John Storer will continue to appear and to do some good, the strides in conservation will be made around the pivots of specific and fairly dramatic situations. In the Los Angeles area, for example, what with drought, receding water-levels, fire, flood, mud-flow, and winter-freeze, the land has cursed its inhabitants in just about as many ways as possible, and the citizenry of this colossal municipality is about as ripe as one can hope it will ever be for some sound arguments concerning treatment of land and respect for it. We shall see.—FRANK A. PITELKA.

The Birds of the British Isles. Volume One.—DAVID ARMITAGE BANNERMAN. (Oliver and Boyd, Edinburgh), xviii + 356 pp., 41 colored plates by George E. Lodge. Price, 45 shillings.—Dr. Bannerman, who is well known to ornithologists for his monographic work on the birds of tropical west Africa, has set out to "do" the birds of Great Britain. Three volumes are projected for the passerines alone; and the first, following Hartert's order, includes the crows and jays, starlings, Old World orioles, and finches. (Numbered among the members of the last are the House and Tree sparrows, *Passer*, and the Snow Finch, *Montifringilla*, which are now almost universally considered to belong to the family of weaver birds.) Most of the species accounts include a brief statement of the status of the species in the British Isles, followed by extended sections on identification, local distribution, distribution abroad, migrations, and habits; there is also a short list of references at the end of each account. This plan, however, is varied from species to species, as the case demands. The author's extensive first-hand knowledge of British birds has been supplemented by wide reading, and much information was acquired through correspondence with other ornithologists. As a result, the work is authoritative and scholarly.

The treatment is both subjective and conservative. Those who enjoy reading at length what a bird looks like, where to find it, how many times it has been recorded in Britain, its status in other European countries, and what its nest looks like will probably read and reread Dr. Bannerman's book; those who want to learn about the biology of the birds—what causes a bird to select a given habitat, what its displays and calls mean, and the significance of its present and past distribution—will have to look elsewhere. In the preface, the author has anticipated criticism for his omission of biological information, but such criticism is still valid. In any field, the most important books are those which by their presentation of new ideas and viewpoints stimulate others to contribute to a deeper understanding of the subject.

All but a few of the plates depict one species each, and they are handsomely reproduced. On the whole, I do not think they compare favorably with the work of Thorburn, but it is perhaps too soon to make a final judgment. Depicting the finches, which he paints with small heads and very small eyes surrounded by light rims, is obviously not Lodge's forte. On the other hand, the plate of the Nutcracker (which also appears on the dust jacket) is a beautiful painting, giving a fine feeling of wind and mist. Lodge uses a compositional trick of putting the birds in one

corner or on one side of a picture, leaving the rest of the space nearly or quite devoid of detail. In his painting of the Magpie, this is extremely effective; but he has used it in more than one-fourth of the plates, and its impact quickly lessens with repetition.

The publishers have spared no pains to produce a beautiful book. The result is a volume which all collectors of fine bird books will want to own.—ROBERT W. STORER.

ALEXANDER, H. G. 1953. Roseate Terns in Wigtownshire. Scot. Nat., **65:** 56.

ANDREW, D. G. 1953. Red-throated Diver in Midlothian in June. Scot. Nat., **65:** 124–125.

ANDREWS, F. N., S. R. MILES, and O. S. DAVIS. 1953. Response of inbred lines of chickens to thiouracil. Endocr., **52:** 712–718, 4 tables. Evidence is provided to show that endocrine differences exist between lines or strains of the same species.

AVELEDO H., R., and A. PONS. 1953. Un ave neuva de la region de Perijá. Mem. Soc. Cien. Nat. La Salle (Caracas), **13:** 203–204.—*Acrochordopus zeledoni wetmorei* (Jamayaujaina, Rio Negro, Sierra de Perijá, Zulia, Venezuela) new subspecies.

BAGENAL, T. B. 1953. The birds of St. Kilda, 1952. Scot. Nat., **65:** 19–24.—Birds seen 24 July to 10 August, 1952, on Hirta and Dun of the St. Kilda group.

BAKER, M. F. 1952. Population changes of the Greater Prairie Chicken in Kansas. Trans. 17th N. Amer. Wildl. Conf., pp. 359–366.—*Tympanuchus cupido pinnatus* survives in Kansas only where some 60 per cent of the native prairie still exists; it reached an all-time low in 1913 and has since fluctuated. The best range carried about 100 birds per square mile in 1949. Peaks were followed by hunting periods in 1941–43 and 1950–51 each of which resulted in a low marked by 56 and 46 per cent young in the samples studied. Hunters took about 50 per cent of the fall population on a study area and appear to have contributed importantly to the recent decline of the species in this state.—J. J. Hickey.

BALHAM, R. W., and W. H. ELDER. 1953. Colored leg bands for waterfowl. Journ. Wildl. Mgt., **17:** (4): 446–449.—Rigid acrylic resin bands, available in many colors under the trade name Plexiglas, are heated before application. Permanency of band and fidelity of colors are claimed.—J. J. Hickey.

BANNERMAN, D., and J. BANNERMAN. 1953. Common Scoters resting ashore. Scot. Nat., **65:** 54.—After a storm.

BARRUEL, P. 1953. Iconographie des oiseaux de France. L'Ois. et Rev. Fr. d'Ornith, **23,** supplement (also listed as Mem. Soc. Ornith. de France et de l'Union Francaise, No. 5). This attractive publication consists of 20 colored plates by Barruel with accompanying text (40 unnumbered pages) by Barruel, J. Dorst, P. Engelbach, R. D. Etchecopar, Fr. Hue, Chr. Jouanin, G. Olivier, and J. Rapine, prepared under the direction of J. Berlioz. 82 species are represented, and brief accounts of their field marks, status, and distribution are included in the text. According to the introduction, a second part is scheduled for publication this year, and a third is to appear in 1955. The plates are, on the whole, excellent although in a few instances Barruel has drawn some parts of a bird out of proportion with the rest (see especially the large feet on the Sparrow Hawk and the small bill on the Bullfinch). He has demonstrated remarkable skill in illustrating several species on one plate and at the same time achieving an interesting composition and balance of colors.—Robert W. Storer.

BATTS, H. L., JR. 1953. Siskin [*Spinus pinus*] and Goldfinch [*Spinus tristis*] feeding at sapsucker tree. Wilson Bull., **65** (3): 198.

BEARD, E. B. 1953. The importance of beaver in waterfowl management at the Seney National Wildlife Refuge. Journ. Wildl. Mgt., **17** (4): 398–436.—High duckling production (1.7–4.6 per acre per year) resulted where beaver dammed up sandy sedge marshes, increased the interspersion of cover and water, permitted ducks to move easily between different cover types, created water acres ½ to 3 feet deep, and made for a rich variety of aquatic animals. The important inference is drawn that waterfowl production can be best increased by the creation of small water areas, rather than by large impoundments.—J. J. Hickey.

BEHLE, W. H. 1954. Changing status of the starling in Utah. Condor, **56**: 49–50.

BELLROSE, F. C. 1953. A preliminary evaluation of cripple losses in waterfowl. Trans. 18th N. Amer. Wildl. Conf., pp. 337–360.—Field and laboratory studies of lethal and nonlethal effects of shot pellets upon ducks, principally *Anas platyrhynchos*. Of every 100 Mallards flying south along the Mississippi Flyway, 60 will be hit by shot, 32 will be bagged, 8 or 9 will die as cripples, and 19 or 20 will live to carry pellets in their bodies.—J. J. Hickey.

BENSON, C. W. 1953. A check list of the birds of Nyasaland (including data on ecology and breeding seasons). 118 pp. (The Nyasaland Society and The Publications Bureau, Blantyre and Lusaka, Nyasaland).—Annotated list of 609 species. The accounts, presented in an abbreviated telegraphic style, include much valuable material on habitat and breeding season. Brief notes on subspecies are included, but the emphasis is on the species, which is a commendable point of view. Hypothetical lists, a gazeteer, and a list of vernaculars are included in the appendices.—Robert W. Storer.

BLACKWOOD, G. G. 1953. Great Grey Shrike in Perthshire. Scot. Nat., **65**: 59.

BLOUCH, R. I., and L. L. EBERHARDT. 1953. Some hatching curves from different areas of Michigan's Pheasant range. Journ. Wildl. Mgt., **17** (4): 477–482.

BOASE, H. 1953. Little Gull in Angus. Scot. Nat., **65**: 129–230.

BOURNE, W. R. P. 1953. On the races of the Frigate Petrel, *Pelagodroma marina* (Latham) with a new race from the Cape Verde Islands. Bull. Brit. Ornith. Club, **73** (7): 79–82. Three races recognized, nominate *marina* with *P. marina maoriana* as a synonym, *P. m. hypoleuca*, and *P. m. eadesi*, new subspecies, Cima, Cape Verde Archipelago.

BRAKHAGE, G. K. 1953. Migration and mortality of ducks hand-reared and wild-trapped at Delta, Manitoba. Journ. Wildl. Mgt., **17** (4): 465–477.—No differences in migration speed, migration route, or homing tendency were noted for 4 species. Hand-reared birds were more vulnerable to local shooting pressure and underwent consistently higher mortality than wild-trapped ducks.—J. J. Hickey.

BUSS, I. O., and B. A. SCHOTTELIUS. 1954. Breeding age of Blue Grouse. Journ. Wildl. Mgt., **18** (1): 137–138.—At least some *Dendragapus obscurus* retain the bursa of Fabricius until about 2 years of age when they apparently begin to breed.

BUTLER, J. F. 1953. Sanderlings in South Inverness. Scot. Nat., 65: 56.

CAMERON, J. I. 1953. Early arrival of Fieldfares. Scot. Nat., **65**: 58.

CARDIFF, E. and B. CARDIFF. 1954. A winter record for the Swamp Sparrow in the Imperial Valley, California. Condor, **56** (1): 54.

CARNIE, S. K. 1954. Food habits of nesting Golden Eagles in the Coast Ranges of California. Condor, **56** (1): 3–12. From 1947 to 1952 a study was conducted on the hunting methods, prey, nesting, and development of young of 17 pairs of golden eagles. Food items were 77 per cent mammals (mostly jackrabbit and ground squirrel), 13 per cent birds, 6 per cent snakes, and 4 per cent fish.

CASWELL, E. B. 1954. A method for sexing Blue Grouse. Journ. Wildl. Mgt., **18** (1): 139.

CHAPIN, J. P. A new race of *Cisticola lateralis* (Fraser). Bull. Brit. Ornith. Club, **73** (7): 83–84. *C. l. vincenti*, new subspecies, 160 kilometers west of Baraka, Belgian Congo. *C. l. modesta* (Bocage) is scarcely distinguishable from *C. l. antinorii* (Heuglin).

CLANCEY, P. A. 1953. A preliminary list of the birds of Natal and Zululand; with a short account of the status of each. 55 pp. (The Durban Museum, Durban, South Africa).—Annotated list of 561 species. The status and distribution of each subspecies is briefly indicated.

CLANCEY, P. A. 1953. The British race of Lesser Redpoll. Bull. Brit. Ornith. Club, **73** (6): 72. *Carduelis flammea disruptis*, Argyllshire, Scotland, new subspecies.

CLANCEY, P. A. 1953. Notes on geographical variation in the south African populations of *Lybius torquatus* Dumont. Bull. Brit. Ornith. Club, **73** (9): 102–104. Three races recognized.

CLAY, W. M. 1953. Protective coloration in the American Sparrow Hawk. Wilson Bull., **65** (3): 129–134, 1 fig.—Suggesting that the head markings of *Falco sparverius* are adaptively deceptive.

COOCH, G. 1953. Techniques for mass capture of flightless Blue and Lesser Snow Geese. Journ. Wildl. Mgt., **17** (4): 460–465.—The old Eskimo trick of surrounding flightless geese and then permitting them to follow a human leader (for several days if necessary) into a trap; described in detail. In a tundra project, jointly sponsored by Cornell University and The Stone Age, 15,000 birds were placed "under control" at a single time.—J. J. Hickey.

COOMBES, R. A. H. 1952. Mountain Birds. (Penguin Books, London) 32 pp., 16 colored plates by G. E. Lodge. Price, $0.95.—Sixteen species (8 of them hawks) of British mountain birds figured and brief accounts of their habits presented in the text.

CROSS, A. 1953. Red Grouse feeding and drinking. Scot. Nat., **65**: 128.

CROSS, A. 1953. Greater Black-backed Gull diving for food. Scot. Nat., **65**: 129.

DALL, G. 1953. Gathering of Long-tailed Tits in East Fife. Scot. Nat., **65**: 57.

DELACOUR, J. 1953. Comment on the geographical variation of the Monal, *Lophophorus impeyanus* Latham. Bull. Brit. Ornith. Club, **73** (2): 26.—No subspecies recognized.

DENTON, J. F. 1953. Notes on Sprague's Pipit wintering in Georgia. Oriole, **18**: 41–44. An intensive discussion of the habits and habitat of this species, rediscovered in the state after fifty years.

DE SCHAUENSEE, R. M., and S. D. RIPLEY. 1953. Birds of Oman and Muscat. Proc. Acad. Nat. Sci. Philadelphia, **105**: 71–90. *Ammomanes deserti taimuri* (near Muscat, Oman, S. E. Arabia), *Turdoides squamiceps muscatensis* (As Sib, near Muscat), and *Prinia gracilis carpenteri* (Whatayah, near Muscat) new subspecies.

DULIN, W. E. 1953. The effects of adrenocorticotropin on the White Leghorn cockerel and capon. Endocr., **53**: 233–235, 2 tables.

EATON, S. W. 1953. Wood warblers wintering in Cuba. Wilson Bull., **65** (3): 169–174, 1 table.—Behavior of North American warblers in Cuba in the winter.

EDMINSTER, F. C. 1953. Snapping turtle catches Pheasant. Journ. Wildl. Mgt., **17** (3): 383.—For *Phasianus colchicus* in Pennsylvania, even the drinking water is not safe.

EDWARDS, R. Y. 1953. Barrow's Golden-eye [*Bucephala islandica*] using Crow [*Corvus brachyrhynchos*] nests in British Columbia. Wilson Bull., **65** (3): 197–198, 1 fig.

ERICKSON, A. B. 1953. *Leucocytozoon bonasae* in Ruffed Grouse; its possible relationship to fluctuations in numbers of grouse. Journ. Wildl. Mgt., **17** (4): 536–538.—Of 153 *Bonasa umbellus* examined over an 11-year period, 71 per cent were infected. This protozoan appears to be a widespread but relatively harmless parasite of grouse, a conclusion which Karl Borg (1953) independently reached with reference to Capercaillie, Black Grouse, and Hazel Grouse.—J. J. Hickey.

EVENDEN, F. G. 1954. Courtship activities of the Inca dove. Condor, **56** (1): 53.

EYSTER, M. B. 1954. Quantitative measurement of the influence of photoperiod, temperature, and season on the activity of captive songbirds. Ecol. Monogr., **24**: 1–28.—Automatic recording showed that the nonmigratory English Sparrow did not display nocturnal activity at any season while the migratory White-throated Sparrow, White-crowned Sparrow, and Slate-colored Junco displayed nocturnal unrest during the spring migratory period. Nightly rest pauses usually occurred before the onset of nocturnal activity and again afterwards, so that maximum activity of caged birds came at the same hours as the greatest flight density of migrating birds. Analysis is made of effects on activity of temperature, increased photoperiods, time of day, and lack of food.

FANT, R. J. 1953. A nest-recording device. Journ. Animal Ecol., **22**: 323–327.—An automatic recording apparatus registered periodicity of egg laying and incubation at four nests of the partridge, *Perdix p. perdix*.

FRADE, F. 1949. Algumas novidades para a fauna da Guiné Portuguesa (Aves e Mamiferos). Anais Junta de Investigaçoes coloniais, **4** (4): 165–186.—18 species of birds listed as new to the recorded avifauna of Portuguese Guinea; none of them constituting great extensions of range.

FRASER, J. 1953. Waxwing feeding on apples. Scot. Nat., **65**: 59.

GINES, HNO., R. AVELEDO H., A. PONS, G. YEPEZ, and R. MUÑOZ-TEBAR. 1953. Lista y comentario de las aves colectadas en la region. Mem. Soc. Cien. Nat. La Salle (Caracas), **13**: 145–202.—Annotated list of the birds collected in the region of Perijá, Venezuela.

GINES, HNO., and G. YEPEZ T. 1953. Ojeada general sobre la avifauna de la region. Mem. Soc. Cien. Nat. La Salle (Caracas), **13**: 135–140.—Introduction to the birds of the region of Perijá, Venezuela.

GLENNY, F. H. 1953. A systematic study of the main arteries in the region of the heart. Aves XIII. Ciconiiformes, Part 2. Ohio Journ. Sci., **53**: 347–348.

GLENNY, F. H. 1953. A systematic study of the main arteries in the region of the heart. Aves XX. Caprimulgiformes, Part 1. Ohio Journ. Sci., **53**: 356–357.

GLENNY, F. H. 1953. A systematic study of the main arteries in the region of the heart. Aves XIX. Apodiformes, Part 1. Ohio Journ. Sci., **53**: 367–369, 1 fig.

GLOVER, F. A. 1953. A nesting study of the Band-tailed Pigeon (*Columba f. fasciata*) in northwestern California. Calif. Fish and Game, **39** (3): 397–407.—In 1950, migration peaked in second half of April; cooing peaked in June and July (9 to 10 a.m.); radii of territories averaged ¼ mile (0.1 to 0.5) and were 0.45 mile apart. On a study area with 109 pairs, 30 "producing pairs" were observed in July and 45 more in August, and from these a hatching and rearing success of about 73 per cent was calculated. A postbreeding census of 123 birds revealed 0.4 young per adult, an age ratio similar to one found by Morse (1949) among

hunters' bags in Oregon. [This productivity is by far the lowest reported for a so-called gamebird in North America, being roughly one-half of our Woodcock's, one-quarter of our Mourning Dove's, and of the same order as the Passenger Pigeon's.]—J. J. Hickey.

GOODBODY, I. M. 1953. Lesser Grey Shrike in Aberdeen. Scot. Nat., **65:** 131–132.

GOODEN, S. K. 1953. A collapsible quail trap. Journ. Wildl. Mgt., **17** (3): 389–391.

GOODWIN, D. 1953. Taxonomic notes on the Himalayan Alpine Accentors. Bull. Brit. Ornith. Club, **73** (3): 28–31. Three subspecies recognized with *cacharensis* Hodgson and *ripponi* Hartert declared to be synonyms of *Prunella collaris nipalensis* Blyth.

GORDON, S. 1953. Hoopoe in west Sutherland. Scot. Nat., **65:** 56.

GRAHAM, J. 1953. Willow-tit, *Parus atricapillus*, in Sutherland. Scot. Nat., **65:** 130–131.

GRANT, C. H. B., and C. W. MACKWORTH-PRAED. 1953. On the type of *Charadrius pallidus* Strickland, the name *Hiaticula heywoodi*, and the races of *Charadrius marginatus* Vieillot. Bull. Brit. Ornith. Club, **73** (1): 12–14. *C. pallidus* is older than *C. rufocincta* Reichenow, and its type locality is shown to be Walfish Bay. *H. heywoodi* is a *nomen nudum*. Four races are recognized in *C. marginatus*.

GRANT, C. H. B., and C. W. MACKWORTH-PRAED. 1953. On the status of *Heterhyphantes golandi* Stephenson Clarke. Bull. Brit. Ornith. Club, **73** (3): 31–32. This form is stated to be a melanistic phase of *Ploceus i. intermedius* Rüppell.

GRANT, C. H. B., and C. W. MACKWORTH-PRAED. 1953. A new race of woodpecker from Portuguese East Africa. Bull. Brit. Ornith. Club, **73** (5): 55–56. *Campethera bennettii vincenti*, 60 miles north of Tete, new subspecies.

GRANT, C. H. B., and C. W. MACKWORTH-PRAED. 1953. Notes on some petrel names. Bull. Brit. Ornith. Club, **73** (9): 100–101. *Pterodroma aterrima* Bonaparte is the correct name for the Kerguelen Island Petrel and *P. brevirostris* Lesson for the Mascarene Black Petrel. *P. lugens* Kuhl is a synonym of *P. grisea* Gmelin.

GREELEY, F. 1953. Sex and age studies in fall-shot Woodcock (*Philohela minor*) from southern Wisconsin. Journ. Wildl. Mgt., **17** (1): 29–32.—Females have a broader outer primary than males; juveniles possess the bursa of Fabricius. Females slightly outnumbered males as in other studies; there were 1.4 young per adult female.

GRIERSON, J. 1953. Chaffinches with successive broods in same nest. Scot. Nat., **65:** 132.

GRIERSON, J. 1953. Waders landing on water directly from flight. Scot. Nat., **65:** 128–129.—*Erolia alpina*, *Tringa totanus*, and *Calidris canutus*.

GROZDANIĆ, DR. S. 1950. The Obedska Swamp and the necessity for its protection (translation of title). Zashtita Prirode (Protection of Nature), Belgrade, **1:** 69–80.—List of 27 species of water birds nesting in the swamp. In Serbian.

HACHISUKA, M. 1953. New name for a Bush-robin of Formosa. Bull. Brit. Ornith. Club, **73** (3): 33. *Erithacus taiwan*, new name for *Ianthia* (= *Erithacus*) *johnstoniae* Ogilvie-Grant, 1906, preoccupied by *Pogonocichla* (= *Erithacus*) *johnstoni* Shelley, 1893.

HALL, B. P. 1953. Colour variation in *Sturnus sinensis*. Bull. Brit. Ornith. Club, **73** (1): 2–8.

HALL, B. P. 1953. Notes on some Minivets in the British Museum. Bull. Brit. Ornith. Club, **73** (6): 63–65. *Pericrocotus ethologus cryptus* Mayr requires further

study. *P. peregrinus galbinus* Van Tyne and Koelz is not sufficiently distinct from nominate *peregrinus* to warrant recognition.

HANSON, H. C. 1953. Aids for the exploration of the avian cloaca for characters of sex and age. Journ. Wildl. Mgt., **17** (1): 89–90.—Bi-valve nasal speculum, Jackson Light carrier, Welch and Allyn otoscope battery case, and Pilling-Jackson lamp.

HARRISON, J. G. 1953. Symmetrical albinism in birds' wings. Bull. Brit. Ornith. Club, **73** (9): 105–106.

HARTLEY, P. H. T. 1953. An ecological study of the feeding habits of the English titmice. Journ. Animal Ecol., **22:** 261–288.—The food niches of five species of titmice differ in respect to the characteristic height distribution of their foraging activities and preferences for certain species of trees. These niche distinctions disappear at times of temporary superabundance of food.

HAZELWOOD, A., and E. GORTON. 1953. A new race of the jay *Garrulus glandarius* from Scotland. Bull Brit. Ornith. Club, **73** (1): 1–2. *G. g. caledoniensis*, new subspecies, Perthshire.

HAZELWOOD, A., and J. M. HARRISON. 1953. A note on *Larus "capistratus"* Temminck. Bull. Brit. Ornith. Club, **73** (9): 98–100, 1 fig.

HEBARD, F. V., and A. W. GARDNER. 1954. Mountain-top visits by birds at Aspen, Colorado, in winter and early spring. Condor, **56** (1): 53–54.

HEDGPETH, J. T. 1954. Falcated Teal at San Francisco, California. Condor, **56** (1): 52.

HENDERSON, J. M. 1953. The Osprey in the North-East of Scotland. Scot. Nat., **65:** 54–56.

HICKEY, J. J. 1954. Mean intervals in indices of wildlife populations. Journ. Wildl. Mgt., **18** (1): 90–106.—A critical review of censuses and indices of the 9- to 10-year population "cycle." In general, hare populations decline before grouse do. A clear-cut 10-year cycle is accepted for 3 mammalian predators at the continental level and for the Minnesota Ruffed Grouse census published by King (1937) and Marshall (1954).—J. J. Hickey.

HICKEY, J. J., and R. A. MCCABE. 1953. Sex and age classes in the Hungarian Partridge. Journ. Wildl. Mgt., **17** (1): 90–91. Structure of the *Perdix perdix* population in Wisconsin in 1951 was similar to that found in Denmark by Westerskov (1951) and to that reported generally for *Colinus virginianus*. Hatching peak June 28 to July 4.

HILLMAN, M., and M. M. ERICKSON. 1954. The Prothonotary Warbler in California. Condor, **56** (1): 52–53. This specimen is the first state record.

HOPKINS, M. N., and E. P. ODUM. 1953. Some aspects of the population ecology of breeding Mourning Doves of Georgia. Journ. Wildl. Mgt., **17** (2): 132–143.—Breeding pairs averaged 3.3 per 100 acres; density seemingly correlated with "edge effects"; colonies as found in Iowa were absent; low production (only 2.1 birds per pair in spite of 48 per cent nesting success); spot-mapping method of census recommended for this type of dove range.—J. J. Hickey.

HOWELL, T. R., and G. A. BARTHOLOMEW, JR. 1954. Experiments on social behavior in nonbreeding Brewer Blackbirds. Condor, **56** (1): 33–37. Dummies of four species were set out, and the responses of Brewer Blackbirds were noted. Female Brewer Blackbird dummies produced a greater variety of responses during the breeding season, including gathering by both sexes and mounting with or without copulation by males. Seasonal variation in responses was attributed to androgen level.

HOYT, S. F. 1953. Incubation and nesting behavior of the Chuck-will's-widow [*Caprimulgus carolinensis*]. Wilson Bull., **65** (3): 204–205.

HUEY, L. M. 1954. Notes from southern California and Baja California, Mexico. Condor, **56** (1): 51–52. Additional knowledge on the ranges and habits of 10 species is presented.

HUNT, G. S., and K. J. DAHLKA. 1953. Live trapping of diving ducks. Journ. Wildl. Mgt., **17** (1): 92–95.—Trap design.

HUNT, G. S., and H. E. EWING. 1953. Industrial pollution and Michigan waterfowl. Trans. 18th N. Amer. Wildl. Conf., pp. 360–368. Heavy duck mortality on the Detroit River in 1948 was caused by cold weather, starvation, and pollutants. More than 2,000 gallons of oil daily settle to the bottom of this river and render it a biological desert.—J. J. Hickey.

HUSTON, T. M., and A. V. NALBANDOV. 1953. Neurohumoral control of the pituitary in the fowl. Endocr., **52**: 149–156, 4 tables.

IMHOF, THOMAS A. 1953. Effect of weather on spring bird migration in northern Alabama. Wilson Bull., **65** (3): 184–195, 3 figs., 4 tables.—The numbers of transient species in spring at Birmingham, Alabama, were correlated with weather conditions. Most transients were observed, and therefore were not migrating, after the passage of a cold front, and fewest were observed in clear, warm weather. —J. T. Tanner.

JANSON, R. G. 1953. Observations indicating egg-moving by nesting Pheasants. Journ. Wildl. Mgt., **17** (3): 386.—Six eggs moved about three feet the day before hatching; from a flooded site.

JOHNSON, N. K. 1954. Food of the Long-eared Owl in southern Washoe County, Nevada. Condor, **56** (1):52. From 131 pellets small rodents; six species comprised nearly 98 per cent of the contents.

JOHNSTON, D. W., and M. E. FOSTER. 1954. Interspecific relations of breeding gulls at Honey Lake, California. Condor, **56** (1): 38–42. Sympatric Ring-billed and California gulls exhibited an ecological separation in timing of the breeding cycle. On a given date nests of Ring-billed Gulls contained either young or eggs at least one-half incubated, but contiguous California Gull nests had eggs incubated less than one week.

JORDAN, J. S. 1953. Consumption of cereal grains by migratory waterfowl. Journ. Wildl. Mgt., **17** (2): 120–123.—Adult drake Mallards averaged 0.08 to 0.16 lb. of corn per day or 0.12 to 0.18 lb. of small grains, according to season and weather; Canada Geese, 0.4 lb. of corn or 0.36 lb. of small grains, in winter; Blue-winged Teal 0.06 lb. of mixed grain in October.

JORDAN, J. S. 1953. Effects of starvation on wild Mallards. Journ. Wildl. Mgt., **17** (3): 304–311.—Acute starvation in captive wild (male) *Anas platyrhynchos* was accompanied by average weight losses of 45 per cent in winter up to 60 per cent in summer, critical levels being reached in the third week, and the greatest mortality in the fourth week. Females differed somewhat, especially in spring mortality, being more resistant. In nature, two weeks of complete starvation would probably not be fatal during normal Illinois winter weather.—J. J. Hickey.

JUDD, W. W. 1953. A collection of feather lice (*Mallophaga*) from birds in Ontario. Trans. Amer. Micros. Soc., **72**: 349–350.

KAY, G. T. 1953. Shetland offshore visitors. Scot. Nat., **65**: 50–52.—Records of seabirds.

KAY, G. T. 1953. The Fulmar's bill. Scot. Nat., **65**: 125–127, 1 fig.—Comparison with the bill of the Herring Gull with regard to the functional morphology.

KIEL, W. H., JR., and A. S. HAWKINS. 1953. Status of the Coot in the Mississippi Flyway. Trans. 18th N. Amer. Wildl. Conf., pp. 311–322.—*Fulica americana* is more and more being hunted as a gamebird, an estimated 2,000,000 having been killed in the United States in 1951–52. Transect studies in Manitoba, a rich breeding area of the species, showed a population decline from 12.4 birds per square mile in 1949 to 4.7 in 1952. In this period a nesting success remained high (97 per cent for 380 clutches), and mean clutch size was 9.88± 0.12.—J. J. Hickey.

KILHAM, L. 1953. Warblers, hummingbird, and sapsucker feeding on sap of yellow birch. Wilson Bull., **65** (3): 198.—Species observed were *Archilochus colubris*, *Dendroica caerulescens*, *Dendroica tigrina*, and *Sphyrapicus varius*.

KIRKPATRICK, C. M., and H. E. MOSES. 1953. Effects of streptomycin against spontaneous quail disease in Bobwhites. Journ. Wildl. Mgt., **17** (1): 24–28.—Successful use shown for experimental birds and game-farm stock.

KOSSACK, C. W., and H. C. HANSON. 1953. Unisexual broods of the Mourning Dove. Journ. Wildl. Mgt., **17** (4): 541.—When 21 broods were raised in captivity, each was found to be unisexual.

LACK, D. 1954. Cyclic mortality. Journ. Wildl. Mgt., **18** (1): 25–37.—A review of population cycles in which the basic cause is postulated to be the dominant rodent's interaction with its vegetable food to produce a predator-prey oscillation. When the rodents decline in numbers, Lack suggests that their bird and mammal predators shift over to depress populations of gallinaceous birds in the same region.—J. J. Hickey.

LAMORE, D. 1953. Ring-billed Gulls [*Larus delawarensis*] stealing fish from female American Mergansers [*Mergus merganser*]. Wilson Bull., **65** (3): 210–211.

LAWRENCE, L. DE K. 1953. Notes on the nesting behavior of the Blackburnian Warbler. Wilson Bull., **65** (3): 135–144, 2 tables.—*Dendroica fusca* in Ontario.

LEACH, H. R., C. M. FERREL, and E. E. CLARK. 1953. A study of the Ring-necked Pheasant on irrigated pasture in California. Calif. Fish and Game, **39** (4): 517–525.—For 101 specimens of *Phasianus colchicus*, ladino clover was the staple item of diet throughout the year, 67 per cent of the birds' food being weed seeds. Ridge and ditch-bank nesting sites, plus relative freedom from moving fatalities, contribute to the high percentage (86) of [surviving] hens successful in rearing broods.—J. J. Hickey.

LEACH, H. R., and W. H. FRAZIER. 1953. A study on the possible extent of predation on heavy concentrations of Valley Quail with special reference to the bobcat. Calif. Fish and Game, **39** (4): 527–538.—Mammalian predators take adult quail only incidentally, despite the concentration of *Lophortyx californica* around artificially constructed waterholes.—J. J. Hickey.

LEHMANN, V. W. 1953. Bobwhite population fluctuations and Vitamin A. Trans. 18th N. Amer. Wildl. Conf., pp. 199–246.—*Colinus virginianus* has exhibited spectacular overpopulations in southwestern Texas in 1923, 1930, 1935, and 1941, each time in the second of two successive years of atypically favorable rainfall. The nature of peak or near-peak densities on the King Ranch in 1949 and 1950 is here analyzed, and the dramatic crash of the population in the winter of 1950–51 is shown to coincide with marked nutritional deficiencies, specifically with inability of the quail to maintain reserves of Vitamin A. The intensive analysis of changing population densities, sex and age composition, food habits, and behavior is combined with major physiological and parasitological studies to form a report so rich in detail as to make any short abstract inadequate. This paper is certainly a modern landmark among ecological studies of birdlife.—J. J. Hickey.

LEOPOLD, A. S. 1953. Intestinal morphology of gallinaceous birds in relation to food habits. Journ. Wildl. Mgt., **17** (2): 197–203.—Browsers are shown to have materially longer caeca than seed-eaters, presumably to permit the grouse to winter on sources of low-quality bulk food, by providing storage room for microbial decomposition of cellulose; 20 species examined.—J. J. Hickey.

LEVINE, N. D., and H. C. HANSON. 1953. Blood parasites of the Canada Goose, *Branta canadensis interior*. Journ. Wildl. Mgt., **17** (2): 185–196.—*Leucocytozoon simondi* found in 9 per cent, *Haemoproteus* sp. in 1 per cent, microfilariae in 1 per cent, and *Plasmodium* sp. in 0.3 per cent of 353 geese in Illinois.

LYSAGHT, A. M. 1953. A rail from Tonga, *Rallus philippensis ecaudata* Miller, 1783. Bull. Brit. Ornith. Club, **73** (7): 74–75. This is the correct name of the Tongan race and *R. p. forsteri* Hartlaub, 1852, is a synonym.

MACDONALD, DONALD M. 1953. Lesser Whitethroat in Lewis, Outer Hebrides. Scot. Nat. **65**: 58–59.

MACDONALD, J. D. 1953. The races in South West Africa of the Orange River Francolin. Bull. Brit. Ornith. Club, **73** (3): 34–36. Four races of *Francolinus levalliantoides* are recognized, one of them new, *F. l. wattii*, Windhoek, South West Africa.

MACKWORTH-PRAED, C. W., and C. H. B. GRANT. 1953. On the affinities of *Apus somalicus* (Stephenson Clarke). Bull. Brit. Ornith. Club, **73** (9): 105. These authors disagree with White (1953, Bull. Brit. Ornith. Club, **73**: 77) that this form is a race of *A. niansae*; they consider it to be a separate species.

MACLAREN, P. I. R. 1953. Bird Notes from Nigeria. Nigerian Field, **18** (4): 165–171.—Notes on 35 species, including notes on fledgling or courtship feeding by metallic cuckoos, the extent of nesting association between *Spermetes* and red ants, and the status of *Centropus epomidus*.

MACMULLEN, R. A., and L. L. EBERHARDT. 1953. Tolerance of incubating Pheasant eggs to exposure. Journ. Wildl. Mgt., **17**: (3): 322–330.—Incubating eggs of *Phasianus colchicus* were subjected to low temperatures and simulated rain for various lengths of time. Tolerance to these conditions was great enough to indicate that widespread mortality from unseasonal cold spells would not likely occur in the wild.—J. J. Hickey.

MAIR, W. W. 1953. Ducks and grain. Trans. 18th N. Amer. Wildl. Conf., pp. 111–117.—Research is needed on the ecology of crop depredation by prairie waterfowl.

MANSON-BAHR, SIR PHILIP. 1953. On the migration of the Pacific Golden Plover (*Pluvialis dominica fulva*), the eastern Bar-tailed Godwit (*Limosa lapponica baueri*) and other Limicolae. Bull. Brit. Ornith. Club, **73** (5): 50–55.

MARSHALL, W. H. 1954. Ruffed Grouse and Snowshoe Hare populations on the Cloquet Experimental Forest, Minnesota. Journ. Wildl. Mgt., **18** (1): 109–112.—Progress report on the interesting long-term census of Ruffed Grouse carried out by King (1937), G. A. Swanson, and the author from 1927 to 1953. Peaks occurred in 1933, 1942, and 1951 in grouse, Hare highs at 6-, 8- and 7-year intervals.—J. J. Hickey.

MATVEEV, S. 1950. Protection of birds (translation of title). Zashtita Prirode (Protection of Nature), Belgrade, **1**: 63–67.—A plea for the conservation of birds, particularly rare and beneficial species. In Serbian.

MCCULLOUGH, R., and J. B. LOW. 1953. Waterfowl accidentally caught in muskrat traps. Journ. Wildl. Mgt., **17** (2): 222.—About 3.5 per cent of the total wintering ducks on a Utah refuge were trapped, one for each 4.2 muskrats taken.

McGINNES, B. S., and R. A. BECK. 1953. Recuperative rate of wing-shot Mallard. Journ. Wildl. Mgt., **17** (4): 541–542.

McGOVERN, T. A. 1953. The call-count as a census method for breeding Mourning Doves in Georgia. Journ. Wildl. Mgt., **17** (4): 437–445.—A comparison of transect and study-area data on *Zenaidura macroura*. The seasonal plateau in morning call activity is similar in Georgia to that reported in Maryland and Wisconsin. Moderate colonial behavior was noted; home ranges often exceeded the 100-acre tracts. Counts taken around June 1 at the proper hour and in good weather will provide a useful year-to-year index of population level.—J. J. Hickey.

MEANLEY, B., and J. A. NEFF. 1953. Bird notes from the Grand Prairie of Arkansas. Wilson Bull., **65** (3): 200–201.—On 17 species.

MEIKLEJOHN, M. F. M., and C. E. PALMAR. 1953. Notes on the birds in the Clyde area, 1951. Scot. Nat., **65**: 1–4.

MEIKLEJOHN, M. F. M., and C. E. PALMAR. 1953. Report on birds of the Clyde area, 1952. Scot. Nat., **65**: 115–119.

MEIKLEJOHN, M. F. M. 1953. Garganeys in North Argyll and South Inverness. Scot. Nat., **65**: 127.

MEINERTZHAGEN, R. 1953. On the validity of *Saxicola torquata hibernans* Hartert. Bull. Brit. Ornith. Club, **73** (1): 14–15. This form is stated to be a synonym of *S. rubicola* Linnaeus.

MEINERTZHAGEN, R. 1953. On some west Irish birds and a suggestion for the use of the cline. Bull. Brit. Ornith Club, **73** (4): 41–44. The author discusses 19 continental Palearctic species whose breeding range extends to western Ireland and which represent the extreme in a cline of increasing saturation running from east to west. He proposes that only the populations at both extremes should be recognized nomenclaturally and "that intermediate races from intermediate areas should not bear scientific names." One may sympathize with Meinertzhagen's point of view but his proposal is not likely to be followed in the case of the species he discusses for in most instances the name of the intermediate race which is to be suppressed is a Linnaean one. A new subspecies is described: *Anthus pratensis theresae*, extreme West Ireland.—C. Vaurie.

MEINERTZHAGEN, R. 1953. A new geographical race of Shrike, *Lanius excubitor* Linnaeus. Bull. Brit. Ornith. Club, **73** (6): 72. *Lanius excubitor theresae*, Galilee, northern Palestine, new subspecies.

MENGEL, R. M. 1953. On the name of the Northern Bald Eagle and the identity of Audubon's gigantic "Bird of Washington." Wilson Bull., **65** (3): 145–151, 1 fig., 1 table.—A discussion of Audubon's *Falco washingtonii* (or *washingtoniensis*) concludes that this questionable form cannot now be identified and that the name of the Northern Bald Eagle should be *Haliaeetus leucocephalus alascanus* Townsend.—J. T. Tanner.

MILLER, A. H. 1954. The occurrence and maintenance of the refractory period in crowned sparrows. Condor, **56** (1): 13–20. Under experimental conditions Golden-crowned and White-crowned sparrows were investigated with respect to their refractory periods. An experiment was designed to explain the sustained refractory period of these two species, and it was found that this sustained period was due to a constant fatigue of the pituitary-gonad mechanism.

MILLER, A. W., and B. D. COLLINS. 1953. A nesting study of Canada Geese on Tule Lake and Lower Klamath National Wildlife Refuges, Siskiyou County, California. Calif. Fish and Game, **39** (3): 385–396.—Muskrat houses and islands preferred; eggs in 79 per cent of 201 nests hatched; mean clutch size 5.1, hatching broods 4.4; hatching peak April 23–May 12.—J. J. Hickey.

MILLER, A. D. 1953. Further evidence of the homing ability of the Cowbird [*Molothrus ater*]. Wilson Bull., **65** (3); 206–207.

MITCHELL, R. T., H. P. BLAGBROUGH, and R. C. VAN ETTEN. 1953. The effects of DDT upon the survival and growth of nestling songbirds. Journ. Wildl. Mgt., **17** (1): 45–54.—Applications of 3 pounds per acre affected adult songbirds only slightly, but caused considerable mortality among young nestlings.

MOREAU, R. E. 1953. On the status of *Zosterops phyllicus* Reichenow. Bull. Brit. Ornith. Club, **73** (6): 70–71. This form appears to be aberrant *Z. stenocricotus*.

MURRAY, I. M. 1953. Blackcap in Skye in November. Scot. Nat., **65**: 58.

MURSELL, D. F. 1953. Chaffinch using Greenfinch's Nest. Scot. Nat., **65**: 60.

NELSON, A. L. and A. C. MARTIN. 1953. Gamebird weights. Journ. Wildl. Mgt., **17** (1): 36–42.—Nearly 26,000 weight records from U. S. Fish and Wildlife Service files are summarized for 80 species of birds in terms of means and maxima for each sex.

NELSON, U. C. 1953. Cliff-nesting Canada Geese on the Arctic slope of Alaska. Journ. Wildl. Mgt., **17** (4): 536.—*Branta canadensis leucopareia*, along the Colville River.

O'CONNOR, R. J. 1953. Glycogen in the dividing cells of the liver of the chicken embryo. Nature, **172** (4380): 678–679. No difference could be detected in the glycogen content of dividing and non-dividing cells.

ORNITHOLOGICAL SOCIETY OF NEW ZEALAND. 1953. Checklist of New Zealand Birds. 80 pp. A. H. and A. W. Reed, Wellington, N. Z. Price, 10/6, from J. M. Cunningham, 39 Renall St., Masterton, N. Z.—Annotated list of 333 species and subspecies, indexed. Status and range of each form are given, and important references and illustrations are listed for most forms.

OWEN, D. F. 1953. The autumn migration of the Meadow-pipit and the Skylark on the Kirkcudbright coast. Scot. Nat., **65**: 101–107.

PALMER, J. F. 1953. Willow-tit in North-west Sutherland. Scot. Nat., **65**: 131.

PAPIĆ, J. 1951. Le Marais d'Obed, la question de sa protection et de son etude scientifique. Zashtita Prirode (Protection of Nature), Belgrade, **2–3**: 303–317.—In Serbian, with French summary.

PARMALEE, P. W. 1953. Hunting pressure and its effect on Bobwhite Quail populations in east-central Texas. Journ. Wildl. Mgt., **17** (3): 341–345.—A mistitled "ecological study" of the effect of weather on hunting.—J. J. Hickey.

PENNIE, I. D. 1953. Black Redstart in Caithness. Scot. Nat., **65**: 58.

PERRY, R. 1953. Kingfisher in Inverness-shire. Scot. Nat., **65**: 56.

PERRY, R. 1953. Great Grey Shrike in Inverness-shire. Scot. Nat., **65**: 59.

PETERS, J. L., and A. LOVERIDGE. 1953. Zoological results of a fifth expedition to East Africa. II. Birds from Nyasaland and Tete. Bull. Mus. Comp. Zool., **110** (2): 87–139, pls. 1–2.

PETRABORG, W. H., E. G. WELLEIN, and V. E. GUNVALSON. 1953. Roadside drumming counts / a spring census method for Ruffed Grouse. Journ. Wildl. Mgt., **17** (3): 292–295.—Directions for setting up a spring population index of male *Bonasa umbellus* as used in Minnesota, together with a brief summary of results obtained from 1949 to 1952. The principles on which the technique is based are stated only in general terms, and one wishes that more details would be given concerning the variables encountered.—J. J. Hickey.

PITTMAN, J. A. Direct observation of the flight speed of the Common Loon [Gavia immer]. Wilson Bull., **65** (3): 213.

PLACE, G. 1953. Flock of Goldfinches in Perthshire. Scot. Nat., **65**: 132.

PRIGOGINE, A. 1953. Contribution à l'étude de la Faune ornithologique de la région à l'ouest du lac Edouard. Ann. Mus. Roy. Congo Belge, Tervuren, Ser. 8, vol. **24:** 1–117, 27 fig.—Annotated list of 396 species and subspecies with lists of specimens collected, status, and habitat. A section on the distribution of birds in the region studied, a gazetter, and a bibliography conclude the work. Many photographs of the region and its birds are included.

RAY, A. P., V. N. BHATNAGAR, and M. K. MENON. 1953. A Plasmodium in the common Indian partridges. Nature, **172** (4380): 687. Gametocytes and asexual forms of *P. polare* (?) were found in the erythrocytes of *Francolinus pondicerianus interpositus*.

RIDLEY, M. W., H. G. PERCY, and R. C. PERCY. 1953. The birds of Bwamba—Further Additions. The Uganda Journal, **17** (2): 161–165.—Eighteen species added to the Bwamba list, none of a surprising nature from a geographic standpoint.

RIEFFENBERGER, JOSEPH C. 1953. Identification of songbird nests by reclaimed eggshell fragments. Wilson Bull., **65** (3): 196.

RINTOUL, L. J., and E. V. BAXTER. 1953. Common Scoter in St. Andrews Bay. Scot. Nat., **65:** 52–53. Flocks of molting males present during the summer, females and young appear in the fall. (Additional notes on this subject on pp. 53 and 54 by the editors, V. C. Wynne-Edwards and James W. Campbell.)

ROSEN, M. N., and A. L. BISCHOFF. 1953. A new approach toward botulism control. Trans. 18th N. Amer. Wildl. Conf., pp. 191–199.—In the Tulare Lake Basin, an expected outbreak of this epizootic in 1952 was reduced to 1 per cent mortality by herding the ducks, changing water levels and by distributing feed elsewhere. A similar outbreak in 1941 took 20 per cent.—J. J. Hickey.

ROWAN, W. 1954. Reflections on the biology of animal cycles. Journ. Wildl. Mgt., **18** (1): 52–60.—Critical arguments are advanced against Cole's 1954 postulate of random population cycles and for a biological explanation. A population index based upon nearly 100 observers in Alberta shows a generally synchronized oscillation of Ruffed Grouse, Sharp-tailed Grouse, European [Hungarian] Partridge, and Varying Hare.—J. J. Hickey.

SACHS, I. B. 1953. Certain Blood-inhabiting protozoa of birds in the vicinity of Urbana, Illinois. Trans. Amer. Micros. Soc., **72:** 216–227, 2 tables.

SCHAEFER, E. 1954. The bird with the stone on its head. Frontiers (Acad. Nat. Sci. Philadelphia), **18** (3): 67–69. 2 phots.—An account of the life history of the Helmeted Curassow (*Pauxi pauxi*), including descriptions of "song" and nest. Incubation by female, who usually leaves the nest but once a day during the incubation period of 34 to 36 days.

SCHELL, S. C. 1953. Four new species of *Microtetrameres* (Nematoda: Spiruroidea) from North American birds. Trans. Amer. Micros. Soc., **72:** 227–236, 3 plates.

SCHULTZ, V. 1953. Status of the Ruffed Grouse in Tennessee. Migrant, **24:** 45–52.

SICK, H. 1953. The voice of the Grand Potoo [*Nyctibius grandis*]. Wilson Bull., **65** (3): 203.

SIEBENALER, J. B. 1954. Notes on autumnal trans-gulf migration of birds. Condor, **56** (1): 43–48. From mid-September to mid-October, 1952, observations were made from many locations in the Gulf of Mexico, mostly between Alabama and Mississippi and the Yucatan Peninsula. Of hundreds of birds seen, representing many species, the general direction of flight was southward.

SIIVONEN, L. 1954. Some essential features of short-term population fluctuation. Journ. Wildl. Mgt., **18** (1): 38–45.—The sharpness of the 3- to 4-year fluctuations in 3 tetraonids in Finland progressively decreases from north to south. Fluctuations in numbers are markedly synchronized among tetraonids in Finland, in Norway, and in Britain, and in small rodents in Finland, Norway, and eastern North America. Clutch size, hatched eggs, July broods, and population level in autumn vary annually and in a somewhat similar fashion for Capercaillie, Blackgame, and Hazel Grouse. Cole's argument for randomly operating environment factors may be considered practically watertight as an explanation of cycles in the southern regions, but probably calls for readjutment as regards the northern basic fluctuation.—J. J. Hickey.

SIMS, R. W. 1953. On the status of *Cyanoramphus magnirostris* Forbes and Robinson, Liverpool Mus., 1, p. 21, 1897, Tahiti, Society Islands. Bull. Brit. Ornith. Club, **73** (9): 104–105. Determined to be a synonym of *Platycercus cookii* Gray and the unique specimen to have come from Norfolk Island, not Tahiti.

SHELDON, W. G. 1953. Woodcock studies in Massachusetts. Trans. 18th N. Amer. Wildl. Conf., pp. 369–377.—A number of interesting facts are now emerging from this successful banding project of *Philohela minor* on its breeding grounds. A singing male will often attempt to mate with different decoys at "widely separated" sites. Among 54 "returns," 60 per cent were recaptured an average of one mile's distance from the original trapping site. Recommendations for improving census techniques are given. "The calculated annual mortality of adults is 63 per cent," based principally on a 37 per cent recapture rate in two successive years. [Lack's (1943) estimate of an adult mortality rate of about 37 per cent per year for the European Woodcock (*Scolopax rusticola*), should be noticed here, as the brood size of this species (3.2—Alexander) is only slightly less than the 3.9 (Mendall and Aldous) of the North American bird. The age ratio of 42 juveniles: 58 adults found among fall-shot Wisconsin birds by Greeley (1953) over a 6-year period carries the implication that a mortality rate for adults may indeed be approximately 42 per cent per year. Although this implication must be limited by potential biases in Greeley's field sampling, it seems to me more tenable than the assumption underlying Sheldon's calculation: that retrapping programs of this type can attain 100 per cent efficiency in relocating surviving adults.] One of the Massachusetts birds was found to resettle 5 miles away.—J. J. Hickey.

SMITH, A. J. 1953. Wryneck in Inverness-shire. Scot. Nat., **65**: 57.

SMITH, R. H. 1953. A study of waterfowl production on artificial reservoirs in eastern Montana. Journ. Wildl. Mgt., **17** (3): 276–291.—Pond size was positively correlated with usage by 5 species of dabbling ducks and their production of broods, biometrical tests being used to establish the significance of the results at 1 per cent levels of probability. There are many interesting ecological observations in this paper, but one is tempted to question the application of statistical methods to establish what is really a well known corollary of a law of physics: the biggest ponds will have the biggest total numbers of ducks. The more pertinent ecological question faced by conservationists is this: is pond size positively correlated with waterfowl usage and production *per acre of water?* Our whole reaction to modern drainage depends upon the answer. Stoudt (1950) has already answered this question for the Dakotas, the relationship being inverse rather than positive. The Montana data, as given in this paper, really indicate that the smallest-size group of ponds had the highest density of ducks and of broods per acre of water. There remains finally the unhappy impression that some parts of this 16-page

publication are badly padded. This is driven home when four statistics, cited for Green-winged Teal and Gadwall nests, are carried out to one decimal place each (per cent of nest success, average number of eggs, etc.) although only one nest was found for each species.—J. J. Hickey.

SNYDER, L. L. 1953. An apparently hybrid golden-eye. Wilson Bull., **65** (3): 199.—*Bucephala clangula* × *B. islandica*.

SOUTHWICK, C. 1953. A system of age classification for field studies of waterfowl broods. Journ. Wildl. Mgt., **17** (1): 1–8.—Five fairly discrete age classes are recognized for 8 species of ducks.

SPEIRS, J. M. 1953. Winter distribution of Robins east of the Rocky Mountains. Wilson Bull., **65** (3): 175–183, 6 maps.—Of *Turdus migratorius*, from an analysis of banding records and Christmas bird counts.

STAGER, K. E. 1954. Birds of the Barranca de Cobre region of southwestern Chihuahua, Mexico. Condor, **56** (1): 21–32. An annotated list of 91 species is included.

STEINKE, H. 1953. The automobile as a predator of wildlife. Wis. Cons. Bull., **18** (7): 7–10.—Six-year record of 3,362 animals killed on 153,089 miles of highway scanned by the author. Among the birds, 228 Pheasants, 23 Crows, 12 Bobwhite Quail, 10 European Partridge, and 8 Ruffed Grouse are itemized. The 580 "songbirds" are not broken down by species.

STEWART, I. F. 1953. Albinism in Starlings. Scot. Nat., **65:** 60.

TANNER, S. E. 1954. Purple Gallinule in Chavez County, New Mexico. Condor, **56:** 50.

TURNER, L. B. 1953. A rapid method of sexing Canada Geese. Journ. Wildl. Mgt., **17** (4): 542–543.—The profiles (forehead and culmen) of male *Branta candensis* are pictured as markedly different from those of females and, when compared to body weights, are reported to be a much more reliable criterion of the two sexes. Wrist-joint callosity, individual weight, and degree of roughness of scales on the feet are cited as additional criteria which apparently will help separate the intermediate individuals. The technique, admittedly less reliable with juvenile birds, came up for critical discussion at the Midwest Wildlife Conference in December, 1953. As far as I could tell, experienced waterfowl investigators were extremely skeptical of the reliability of Turner's technique on the larger geese of the Mississippi Valley.—J. J. Hickey.

UDAGAWA T. 1952. Karyogram studies in birds, I. Chromosomes of five passeres. Cytologia, **17:** 311–316.—Chromosome numbers of *Alauda arvensis japonica* (♂, 78; ♀, 77), *Lanius tigrinus* (♂, 72), *Prunella rubida rubida* (♂, 84), *Luscinia calliope calliope* (♂, 80), and *Acrocephalus bistrigiceps* (♂, 72; ♀, 71).

UHLIG, H. G. 1953. Weights of Ruffed Grouse in West Virginia. Journ. Wildl. Mgt., **17** (3): 391–392.—Fall weights of 168 *Bonasa umbellus* [presumably *B. u. monticola*] are greater than those for New York reported by Bump (1947). Although quite probably correct, the sex criteria used here await published documentation.—J. J. Hickey.

VAURIE, C. 1953. Geographical variation in *Garrulax erythrocephalus* in central and western Himalayas with description of a new race from Nepal. Bull. Brit. Ornith. Club, 73 (7): 77–79. A strong cline of increasing pigmentation runs from west to east, *G. e. kali*, Baglung District, west central Nepal, new subspecies.

VILLIERS, A. 1953. Observations sur la faune ornithologique de la region de Linguere (Senegal). Notes Africaines. Bull. d'Inform. et de Corresp. de l'Inst. Français d'Afrique Noire, no. 60, 123–125.—71 species listed with brief notes.

WALKINSHAW, L. H. 1953. Life-history of the Prothonotary Warbler. Wilson Bull., **65** (3): 152–168, 7 figs., 5 tables.—An eight-year study of *Protonotaria citrea* in Michigan included nesting behavior and success, banding returns, and histories of pairs.

WARD, P. 1953. The American Coot as a game bird. Trans. 18th N. Amer. Wildl. Conf., pp. 322–329.—Summary of the life cycle of *Fulica americana* at Delta, Man. Many birds are shot by hunters and very few retrieved.

WESTERSKOV, K. E. 1953. A note on partridge terminology. Journ. Wildl. Mgt., **17** (3): 386–387.—*Alectoris rufa*, occasionally termed Red Quail in America, should be called Red-legged Partridge.

WHELAN, MARY-ELIZABETH. 1953. Fresh-water mollusks fed to young Tree Swallows [*Iridoprocne bicolor*]. Wilson Bull., **65** (3): 196.

WHITE, C. M. N. 1953. The races of Coqui Francolin in south and central Africa. Bull. Brit. Ornith. Club, **73** (6): 66–68. Five races recognized; *Francolinus coqui campbelli* Roberts and *F. c. lynesi* Sclater are synonyms of nominate *coqui*, *F. bourquii* Monard of *F. c. angolensis* Rothschild.

WHITE, C. M. N. 1953. A revision of *Sylvietta ruficapilla* Bocage. Bull. Brit. Ornith. Club, **73** (6): 68–70. Six subspecies recognized, three of them new: *S. r. gephyra*, Mwinilunga, Northern Rhodesia; *S. r. makayii*, Malandje, northern Angola; *S. r. schoutedeni*, Tembwe, southwest of Lake Tanganyika.

WHITE, C. M. N. 1953. Systematic and distributional notes on African birds. Bull. Brit. Ornith. Club, **73** (7): 76–77. Notes on size variation in *Accipiter castanilius* Bonaparte; *Treron australis gibberifrons* Madarasz replaces *T. a. granviki* Grote; only two races recognized in *Glaucidium perlatum; Apus somalicus* Stephenson Clarke is a race of *A. niansae* rather than *A. pallidus; Pogoniulus bilineatus* and races are conspecific with *P. leucolaima*.

WHITE, C. M. N. 1953. A note on *Rhinomyias brunneata*. Bull. Brit. Ornith. Club, **73** (7): 83. Validity of *R. b. nicobarica* is confirmed and is stated to be probably non-migratory and resident in the Nicobars.

WHITE, C. M. N. 1953. Variation in *Streptopelia decipiens*. Bull. Brit. Ornith. Club, **73** (8): 85–87. Six races recognized.

WHITE, C. M. N. 1953. Notes on some African larks of the genus *Mirafra*. Bull. Brit. Ornith. Club, **73** (8): 87–91. Geographical variation in *M. africanoides* and *M. rufocinnamomea; M. a. macdonaldi*, new subspecies, southern Ethiopia.

WHITE, C. M. N. 1953. Notes on the taxonomy of the Guinea fowls. Bull. Brit. Ornith. Club, **73** (8): 93–94. *Numida meleagris marchei* Oustalet is a synonym of *N. m. galatea* Pallas, *N. m. transvaalensis* Neumann is a synonym of *N. m. mitrata* Pallas, *N. m. maxima* Neumann and *N. m. bodalyae* are synonyms of *N. m. marungensis* Schalow.

WHITE, C. M. N. 1953. Systematic notes on African birds. Bull. Brit. Ornith. Club, **73** (8): 94–96. *Francolinus sephaena thompsoni* Roberts, *F. s. chobiensis* Roberts, and *F. s. mababiensis* Roberts are synonyms of *F. s. zambesiae* Praed. Three races recognized in *F. bicalcaratus*. *Rhinoptilus africanus raffertyi* Mearns is a valid race. *Glareola pratincola boweni* Bannerman is a synonym of *G. p. fuellerboni* Neumann. *Poicephalus robustus angolensis* Reichenow is a synonym of *P. r. suahelicus* Reichenow. *Poicephalus meyeri neavei* Grant is a synonym of *P. m. matschiei* Neumann. *Malacocincla fulvescens dilutior*, new subspecies, Vila Salazar, northern Angola.

WILLIAMS, J. G. 1953. *Cinnyris mediocris*. A revision of the species and description of a new race. Bull. Brit. Ornith. Club, **73** (1): 8–11. Four subspecies

recognized, one of them new, *C. m. bensoni*, Mt. Dedza, Nyasaland; *C. m. keniensis* Mearns and *C. m. garguensis* Mearns are considered to be synonyms of nominate *mediocris*.

WILLIAMS, J. G. 1953. On the status of *Cinnyris chalybeus capricornensis* [Roberts]. Bull. Brit. Ornith Club, **73** (6): 65–66. This form is stated to be a synonym of *C. chalybeus subalaris* Reichenow.

WILLIAMS, J. G. 1953. On the status of *Cinnyris erikssoni* Timen. Bull. Brit. Ornith. Club, **73** (1): 11–12. Considered to be a synonym of *C. afer ludovicensis* Bocage.

WILLIAMSON, K. 1953. Redwing passage in Autumn at Fair Isle. Bull. Brit. Ornith. Club, **73** (2): 18–23, figs. 1–5. Movements of *Turdus musicus*.

WILLIAMSON, K. 1953. Ortolan and Little buntings and Fair Isle. Scot. Nat., **65**: 60–61.

WILLIAMSON, K. 1953. Migration into Britain from the north-west, autumn 1952. Scot. Nat., **65**: 65–94.—Correlation of migratory movements with weather phenomena. Observations mainly from Fair Isle, Scotland.

WILLIAMSON, K., and E. WILLIAMSON. 1953. Hoopoe pursued by a Merlin. Scot. Nat., **65**: 56–57.

WOLFSON, A. 1953. Correction of data reported on White-throated Sparrows. Condor, **55** (6): 318. Refers to errors in a previous paper, Condor, **55**: 187–192, 1953.

WOLTERS, H. E. 1953. A new name for *Euplectes* (*Diatropura*) *progne ansorgei* Neumann. Bull. Brit. Ornith. Club, **73** (3): 32. *E. progne delacouri*, new name for *Diatropura p. ansorgei* Neumann, 1908, preoccupied by *Pyromelana* (= *Euplectes*) *ansorgei* Hartert, 1899.

WOOTEN, W. A. 1954. Waterfowl losses in the surf along the northern California coast. Journ. Wildl. Mgt., **18** (1): 140–141.—Feathers of surface-feeding ducks and several other birds fill up with sand immediately following severe storms and during off-shore fogs. In one two-month period, 6,000 to 9,000 are believed to have perished along a 25-mile stretch of beach.

WRIGHT, B. S. 1953. The relation of Bald Eagles to breeding ducks in New Brunswick. Journ. Wildl. Mgt., **17** (1): 55–62. *Haliaeetus leucocephalus* is chiefly a scavenger and fish eater in summer. Those that winter turn to coastal waters and in time become locally important predators on waterfowl. Their effect on waterfowl production was found to be negligible. An ingenious experiment to determine food preference is described.—J. J. Hickey.

WYNNE-EDWARDS, V. C., and J. W. CAMPBELL. 1953. A Snowy Owl in the Cairngorms during summer. Scot. Nat., **65**: 129.

WYNNE-EDWARDS, V. C., and J. W. CAMPBELL. 1953. An unusually-coloured juvenile Rook. Scot. Nat., **65**: 130.—Dark brown.

YEPEZ, G. 1953. El indio y las aves. Mem. Soc. Cien. Nat. La Salle (Caracas), **13**: 141–143.

YOCOM, C. F. and S. W. HARRIS. 1953. Food habits of Mountain Quail (*Oreortyx picta*) in eastern Washington. Journ. Wildl. Mgt., **17** (2): 204–207.—Thirty-three examined; 95 items tabulated; *Rhus glabra* the most important food from October 30 to December 16.

NOTES AND NEWS

Seventy-second Stated Meeting of the A.O.U.

The Seventy-second Stated Meeting of the American Ornithologists' Union will be held at Madison, Wisconsin, from Wednesday, September 8, through Sunday, September 12, 1954, by invitation of the University of Wisconsin. Tentative plans call for business meetings on Wednesday, papers sessions on Thursday, Friday, and Saturday, and field trips on Sunday. Chairman of the Local Committee on Arrangements is A. W. Schorger.

Student Membership Awards for 1954 Selected by the A.O.U. Committee on Student Membership Awards

Kile Ray Barbehenn, Cornell University, Ithaca, New York
Alfred Merle Beeton, University of Michigan, Ann Arbor
Chandler Montgomery Fulton, Brown University, Providence, Rhode Island
Wayne A. Goates, University of Utah, Salt Lake City
Paul Hammond Gooding, Clemson Agricultural College, Clemson, South Carolina
Richard Joseph Gordon, Harvard University, Cambridge, Massachusetts
Edwin Gould, Cornell University, Ithaca, New York
Helen Hays, Cornell University, Ithaca, New York
Harold Dewey Irby, Texas Agricultural and Mechanical College, College Station, Texas
Raymond Roy Johnson, Arizona State College, Tempe
James Francis Ponshair, Union High School, Grand Rapids, Michigan
Fred Charles Sibley, Cornell University, Ithaca, New York
David Otto Wilson, University of Arizona, Tucson
Roy Caldwell Winslow, Florida State University, Tallahassee

Following is a list of the members of the Committee on the Nomination of Associates: Douglas S. Miller, *Chairman*, Gordon D. Alcorn, Gordon Alexander, Rollin H. Baker, Fred G. Bard, Paul C. Bibbee, Donald J. Borror, Mrs. Herbert E. Carnes, H. F. Chapman, Ben B. Coffey, Jr., Fannye A. Cook, Joe C. Creager, Richard T. Darby, Otto E. Devitt, J. L. Diedrich, Clara Dixon, William H. Drury, Jr., John J. Elliott, J. Harold Ennis, Harvey I. Fisher, Rowley Frith, Lawrence I. Grinnell, Gordon W. Gullion, Fred T. Hall, Ralph L. Hand, Charles E. Huntington, Thomas A. Imhof, Merlin L. Killpack, Edward B. Lang, Frederick W. Loetscher, Jr., George H. Lowery, Jr., Robert Medcalf, Gale W. Monson, J. J. Murray, Val Nolan, Jr., Harold S. Peters, Karl Plath, Thomas L. Quay, William F. Rapp, Jr., Chandler S. Robbins, Orwin A. Rustad, Oliver K. Scott, Kenneth E. Stager, Louis A. Stimson, Mrs. Rowland Thomas.

I. C. Adams, Jr., Robert I. Bowman, Thomas H. Foster, Robert T. Gammell, W. W. Hill, C. F. Jackson, Kenneth C. Parkes.

We report with regret the death of Dr. Walter K. Fisher, Fellow Emeritus of the Union, on November 2, 1953, and that of Dr. Winsor Marrett Tyler, Fellow, on January 9, 1954.

Bound copies of the "Copenhagen Decisions on Zoological Nomenclature," comprising the additions to, and modifications of, the Règles Internationales de la

Nomenclature Zoologique approved and adopted by the Fourteenth International Congress of Zoology, Copenhagen, August, 1953, are available from

International Trust for Zoological Nomenclature
41 Queen's Gate
London, S. W. 7, England

This 135 page work may be had at 90 cents postpaid. It is hoped that this low price may induce many individual zoologists to purchase it.

We have received notice of a new three-volume work on the birds of Japan by Y. Y. Kiyosu, illustrated with paintings of birds by Shigekazu Kobayashi, colored photographs of eggs, and numerous photographs of the habitats of Japanese birds. Judging from the prospectus, the work is entirely in Japanese.

Letter to the Editor

Museum of Comparative Zoology
Harvard College
Cambridge 38, Massachusetts
10 February 1954

Dear Dr. Storer:

So many requests for information as to the status of Peters's Check-List of Birds of the World had come to the Museum of Comparative Zoology that we think your readers would be interested in the matter.

We have been appointed joint editors to see that the work is completed. Probably seven volumes will be required to contain the families not treated by Mr. Peters. A volume has almost been finished by Dr. Zimmer of the American Museum in New York. Sixteen collaborators have most kindly agreed to contribute the families that remain to be done and each one will be the responsible author of his contribution. We hope by this means to assure that the work will be completed in as short a time as possible.

Very truly yours,
Ernst Mayr
James C. Greenway, Jr.

Useful Information for Field Collectors in Mexico

As a result of the tremendous increase in faunal studies in México on the part of biologists from other countries, particularly the United States, information on the proper method of obtaining scientific collecting permits and regulations concerning the obligations on the part of the collectors is set forth briefly in the following paragraphs in the hope that it will prove helpful to those contemplating biological investigations in México.

Scientific collecting permits are required of all investigators who contemplate taking specimens of amphibians, reptiles, birds, and mammals in México. These permits are issued free of charge by the Direccion General Forestal y de Caza of the Secretaría de Agricultura y Ganaderia, located at Mariscal Street No. 11, México, D. F. All correspondence concerning scientific collecting permits should be addressed to that office. Any representative, including students, of a scientific or cultural institution, who demonstrates qualifications satisfactory to the Mexican Government, is eligible to receive a permit.

Applications should be made at least one month in advance stating the type of study to be undertaken, the part of México in which the study is to be made, and the duration of the field phase of the investigation. A recent photograph of the applicant should accompany the application.

Recipients of scientific collecting permits issued by the Mexican Government are under obligation to fulfill the following requirements as stated in detail on each permit:

a. To return one specimen of each species collected to the Mexican Government. (These specimens will be deposited in the collections of the Instituto de Biología of the University of Mexico, or in some other reliable scientific institution.)
b. To submit a summary of field observations and a list af specimens collected.
c. To send reprints of publications and reports based on the material gathered in México.
d. To cooperate in game law enforcement by reporting cases of game law violations.
e. To abide by the game laws of México, paying particular attention to the seasonal hunting regulations, and cooperating in giving full protection to those species completely protected from hunting. Permission to take species on the protected list may in certain cases be issued at discretion of the Direccion General Forestal y de Caza.

Authorization for temporary importation of firearms and ammunition and for carrying firearms in pursuit of scientific studies in México must be obtained in advance from the Departamento de la Industria Militar. This application may be made to any of the branch offices located in the various custom houses along the Mexican-U. S. Border, or directly to the central office at Tecamachalco, D. F. BERNARDO VILLA R.—*Departamento de Caza, Direccion General Forestal y de Caza, Mexico, D. F., Mexico.*

OBITUARIES

CHARLES THOMAS CHURCH, elected an Associate of the American Ornithologists' Union in 1947, died in New York City, February 15, 1953. He was born in Brooklyn, New York, February 17, 1874. Following graduation from Stevens Institute of Technology in 1895, he became associated with Church and Dwight Company, Inc., and remained with this company until his death except for a period of service in World War I. He served as President of the Company for twelve years and in his last years as Vice-chairman of the Board.

Mr. Church was a member of the New York State Conservation Council, Emergency Conservation Committee, National Audubon Society, International Committee for Bird Preservation, American Wildlife Institute, Ducks Unlimited, and New York Zoological Society. His keen interest in conservation was not motivated by the pleasure received in hunting and fishing. Aside from maintaining feeding stations on his estate, special provisions were made for the nesting of the Wood Duck and Osprey. For some years he was President of the North Shore Bird and Game Sanctuary, founded about 1933 by the late Irving Cox. The sanctuary included all of the Township of Mill Neck, Long Island, and portions of Locust Valley and Oyster Bay. Mr. Church devoted much time and money to the preservation of the sanctuary, but the project had to be abandoned during World War II due to the financial burden involved. He is survived by his widow and three brothers.—A. W. SCHORGER.

JOHN M. DAVIS, an associate of the American Ornithologists' Union since 1920, passed away at Redwood City, California, May 8, 1952.

Mr. Davis was born at Bank Y Gurry, Wales, May 26, 1876, coming to the United States with his parents when a boy of eleven. As with many youngsters, he began his interest in birds with the collection of eggs. Even before leaving Wales, he was searching the countryside for eggs, which he prepared himself. His interest in collecting both eggs and birds continued throughout his life. In later years, as a resident of Humboldt County, California, he concentrated his interest on the shorebirds of that area with a view to tying in the records from the North Pacific Coast with those collected at Humboldt Bay.

Articles and notes by Mr. Davis have appeared in 'The Auk' and 'The Condor' since 1914.—HILDEGARDE HOWARD.

HERBERT RAPHAEL MILLS, elected an Associate of the American Ornithologists' Union in 1949, died in Tampa, Florida, June 27, 1952. He was born in Albion, Michigan, October 19, 1882. His father was Dean of Arts at DePaw University. Schools that he attended were Ulster Academy, Kingston, New York, Cornell College, Mt. Vernon, Iowa, and Baker University, Baldwin, Kansas, where his uncle Dr. Lemuel Herbert Murlin was president. A pathologist by profession, he received his degree at Rush Medical College in 1910.

While at Cornell College he studied birds under Prof. Charles R. Keyes. In 1910 he organized the Audubon Junior Clubs in the public schools of Jacksonville, the first in this state. Active interest in conservation won for him the Gold Medal for Conservation awarded by the Florida State Chamber of Commerce for the year 1946. In 1951 he became an honorary founder of the Society for the Protection of the Flamingo in the Bahamas. The rookeries in Tampa Bay received his special attention. He began furnishing financial aid for their protection in 1934 and made provision for its continuance after his death. The National Audubon Society, on October 19, 1952, dedicated a bronze marker to him on the island of Whiskey Stump, Tampa Bay, as a tribute to his work in conservation.

Articles by him appeared in Bird-Lore (1920) and Audubon Magazine (1952). His reports (Florida Naturalist, 1934; 1935; 1939; 1944) show an amazing increase in the bird populations as a result of protection.—A. W. SCHORGER.

NETTIE LOUISE PURDY MOORE, an Associate of the American Ornithologists' Union, died at Detroit, Michigan, July 31, 1931, at the age of 63. She was the daughter of James Britton Purdy, one of the pioneer ornithologists of Michigan, and was born near Plymouth, Michigan, May 14, 1868. Her father was an active ornithologist and an enthusiastic member of the Union. After his death, in order to keep the family name on the rolls, his daughter joined the Union in 1925 and maintained her membership until her death.

She had inherited a farm from her father but being unable to run it herself and finding it a liability rather than an asset, she finally disposed of it and moved to town where for some years she operated a boarding house for men on the railroad. At that time this place was a division point on the road and railroad crews were obliged to spend the night there while waiting for the return run the next day. Reorganization of the railroad shifted the division point elsewhere and Mrs. Moore's venture ceased to be profitable.—T. S. PALMER.

JOHN LIVZEY RIDGWAY, an Honorary Life Associate of the American Ornithologists' Union, elected in 1890, died at Glendale, California, December 27, 1947, at the age of nearly 89. He was a son of David and Henrietta Reed Ridgway and a brother of Robert Ridgway, one of the founders of the Union. He was born February 28, 1859, in Mt. Carmel, Illinois, and was educated in the public schools of Illinois. In the early '80's he came to Washington, D. C., and through the efforts of his brother secured a position as copyist in the Smithsonian Institution. In July, 1884, he was appointed a draftsman in the U. S. Geological Survey. He was promoted to Chief Illustrator in 1918, and he remained in this position until his resignation in October, 1920, when he moved to California. Here he became associated with the Museum of History, Art, and Science in Los Angeles and later with the California Polytechnic Institute of Pasadena where he continued his work until shortly before his death.

Ridgway was an expert draftsman and is perhaps best known for his treatise on scientific illustration. While most of his professional work comprised geological and paleontological drawings, he also found time to paint birds. His principle activities in this field were colored plates for L. M. Turner's 'Contributions to Natural History of Alaska' (1886), E. W. Nelson's 'Report upon Natural History Collections in Alaska' (1887), 'The Auk' (1891), and A. K. Fisher's classic bulletin on hawks and owls, 1893.—T. S. PALMER.

LEONORA JEFFREY RINTOUL, elected a Corresponding Fellow of the American Ornithologists' Union in 1919, died at Lahill, Largo, County Fife, Scotland, May 22, 1953. She was born at this place on February 2, 1875. Possessing in her early years a broad interest in natural history, she finally concentrated on ornithology. For over a quarter of a century, she spent time on the Isle of May during the seasons of migration. Annual reports on the status of the birds of Scotland were published jointly with Evelyn V. Baxter during the years 1909–1939.

Nearly all of the approximately sixty-five publications bearing her name appeared with Miss Baxter as co-author. In 1928 they published 'The Geographical Distribution and Status of Birds in Scotland'; and in 1935 'A Vertebrate Fauna of Forth,' in the series of Scottish faunas. Unfortunately she did not live to see their two volume work, 'Birds of Scotland, their History, Distribution and Migration,' which appeared in the year of her death.

In spite of her zeal for ornithology, she devoted much time to the Women's Rural Institutes, being in great demand as a speaker. She was elected a member of the British Ornithologists' Union in 1911, and a Fellow of the Royal Society of Edinburgh in 1951, honors infrequently bestowed upon women. She was also a Fellow of the Linnaean Society, and Zoological Society of London. In the founding of the Scottish Ornithological Club, she was one of the most active participants.—A. W. SCHORGER.

MRS. ALLAN D. CRUICKSHANK is widely known for her writing and nature photography. She is author of several books including "FLIGHT INTO SUNSHINE" and "BIRD ISLANDS DOWN EAST." A portfolio of her color photographs was published as a series of four charts last year by Woman's Day—a multi-million circulation general weekly. She is well-known to the thousands of adult campers who have attended the Audubon Camp of Maine since its inception in 1936.

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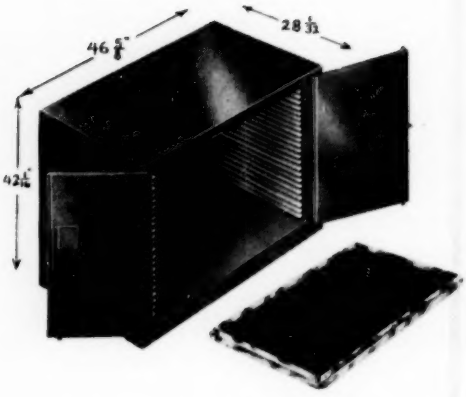

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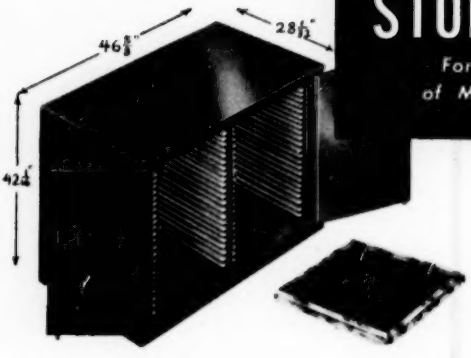

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